MALNAD COLLEGE OF ENGINEERING, HASSAN

(An Autonomous Institution Affiliated to VTU, Belagavi)

Autonomous programme

Bachelor of Engineering

DEPARTMENT OF

COMPUTER SCIENCE AND ENGINEERING

SCHEME and SYLLABUS

V Semester & VI Semester

(2024-25 Admitted Batch)

Academic Year 2026-2027

VISION

To become a prominent department of Computer Science & Engineering producing competent professionals with research and innovation skills, inculcating moral values and societal concerns

MISSION

1. Impart world class engineering education to produce technically competent engineers.
2. Provide facilities and expertise in advanced computer technology to promote research.
3. Enhance Industry readiness and entrepreneurial abilities through innovative skills
4. Nurture ethical values and social responsibilities

PROGRAM EDUCATIONAL OBJECTIVES

PEO1: Graduates will be efficient software developers in diverse fields and will be successful professionals and/or pursue higher studies.

PEO2: Graduates will be capable to adapt to new computing technology for professional excellence and Research and will be lifelong learners.

PEO3: Graduates will work productively exhibiting ethical qualities for the betterment of society.

PEO4: Graduates will possess leadership qualities, work harmoniously in a team with effective communication skills

PROGRAM SPECIFIC OUTCOMES (PSOs)

Upon graduation, students with a degree B.E. in Computer Science & Engineering will be able to:

PSO – 1: To enable students, apply modern software tools and technologies in solving real-world computing problems.

PSO – 2: To enable students, utilize theoretical knowledge, algorithmic thinking and software engineering practices to build efficient and scalable IT systems for real-world applications

PROGRAM OUTCOMES

Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, natural science, computing, and engineering fundamentals and an engineering specialisation to the solution of complex engineering problems.

2. **Problem analysis:** Identify, formulate, and analyse complex engineering problems, reaching substantiated conclusions with consideration for the holistic nature of the problem.

3. **Design/development of solutions:** Design creative solutions for complex engineering problems and design systems, components, or processes to meet identified needs — with consideration for public health and safety, and cultural, societal, and environmental factors. Sustainability is now intrinsic to design.

4. **Conduct investigations of complex problems:** Conduct investigations of complex engineering problems using research-based knowledge and research methods, including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.

5. **Engineering Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling — recognizing their limitations — to solve complex engineering problems.

6. **The Engineer and the World:** Analyse and evaluate societal and environmental aspects while solving complex engineering problems, considering their impact on sustainability with reference to economy, health, safety, legal frameworks, culture, and the environment.

7. **Ethics:** Apply ethical principles and commit to professional ethics, human values, diversity, and inclusion; and adhere to relevant national and international laws.

8. **Individual and Collaborative Team Work:** Function effectively as an individual, and as a member or leader in diverse and multi-disciplinary teams.

9. **Communication:** Communicate effectively and inclusively within the engineering community and with society at large — comprehending and writing effective reports and design documentation, and making effective presentations — considering cultural, language, and learning differences.

10. **Project Management and Finance:** Apply knowledge and understanding of engineering management principles and economic decision-making, and apply these to one's own work, as a member and leader in a team, to manage projects in multi-disciplinary environments.

11. **Life-Long Learning:** Recognise the need for, and have the preparation and ability for, independent and life-long learning, adaptability to new and emerging technologies, and critical thinking in the broadest context of technological change.

Scheme for II Year

THIRD SEMESTER												
Sl. No	**Course Category**	**Course Code**	**Course Title**	**Teaching Hours per Semester**					**Exam Marks**			**Credits**
				L	**T**	**P**	**TW /SL**	**Total**	**CIE**	**SEE**	**Total**	
1.	BSC	24MACS301	Mathematics for Computer Science	56	0	0	64	120	50	50	100	4
2.	IPCC	24CS302	Digital Design and Computer Organization	42	0	28	50	120	50	50	100	4
3.	IPCC	24CS303	Operating Systems	42	0	28	50	120	50	50	100	4
4.	PCCL	24CS304	Data Structures and its Applications	42	0	0	50	90	50	50	100	3
5.	PCCL	24CS305	Data Structures Laboratory	0	0	28	2	30	50	50	100	1
6.	ESC/ETC /PLC	24CS306X	Engineering Science Course (ESC/ETC/PLC)	28	0	28	34	90	50	50	100	3
7.	AEC	24CS307X	Ability Enhancement Course	0	0	28	2	30	50	50	100	1
8.	UHV	24SCR	Societal Connect and Responsibility	0	0	28	2	30	50	50	100	1
9.	BSC	24BCM301	Bridge Course Mathematics -I (Mandate Non-CreditCourse)	42	0	0	0	42	-	-	-	AUDIT
10.	NCMC	25NYP1	NSS, YOGA,PE	0	0	28	0	28	-	-	-	AUDIT
								Total				**21**

Engineering Science Course (ESC/ETC/PLC)		
ESC/ETC/PLC	24CS306A	OOP with Java
ESC/ETC/PLC	24CS306B	OOP with C++

Ability Enhancement Course		
AEC	24CS307A	R Programming
AEC	24CS307B	Data Analytics with Excel
AEC	24CS307C	Data Visualization with Python
AEC	24CS307D	Version Controller with GiT

FOURTH SEMESTER												
Sl. No	**Course Category**	**Course Code**	**Course Title**	**Teaching Hours per Semester**					**Exam Marks**			**Credits**
				L	**T**	**P**	**TW /SL**	**Total**	**CIE**	**SEE**	**Total**	
1.	PCC	24CS401	Design and Analysis of Algorithms	56	0	0	64	120	50	50	100	4
2.	IPCC	24CS402	Microcontroller and Embedded Systems	42	0	28	50	120	50	50	100	4
3.	IPCC	24CS403	Database Management Systems	42	0	28	50	120	50	50	100	4
4.	PCC	24CS404	Algorithms Laboratory	0	0	28	2	30	50	50	100	1
5.	PCCL	24CS405	Unix and shell Programing Laboratory	0	0	28	2	30	50	50	100	1
6.	ESC/ETC /PLC	24CS406X	Engineering Science Course (ESC/ETC/PLC)	28	0	28	34	90	50	50	100	3
7.	AEC	24CS407X	Ability Enhancement Course	0	0	28	2	30	50	50	100	1
8.	BSC	24CS408	Biology for Engineers	0	0	28	2	30	50	50	100	1
9.	UHV	24UHV	Universal Human Values	0	0	28	2	30	50	50	100	1
10.	NCMC	24NYP2	NSS, YOGA,PE	0	0	28	2	30	-	-	-	AUDIT
Total												**20**

Engineering Science Course (ESC/ETC/PLC)		
ESC/ETC/PLC	24CS406A	Optimization Techniques
ESC/ETC/PLC	24CS406B	Discrete Mathematical Structures
ESC/ETC/PLC	24CS406C	Graph Theory and Combinatorics

Ability Enhancement Course		
1	24CS407A	Computer Assembly and Networking
2	24CS407B	Introduction to Power Bi
3	24CS407C	Technical writing using Latex
4	24CS407D	UI/UX Laboratory

Scheme for III Year

FIFTH SEMESTER												
Sl. No	**Course Category**	**Course Code**	**Course Title**	**Teaching Hours per Semester**					**Exam Marks**			**Credits**
				L	**T**	**P**	**TW /SL**	**Total**	**CIE**	**SEE**	**Total**	
1.	PCC	24CS501	Finite Automata and Formal Languages	28	28	0	34	90	50	50	100	3
2.	PCC	24CS502	Software Engineering and Project Management	42	0	0	48	90	50	50	100	3
3.	IPCC	24CS503	Computer Networks	42	0	28	50	120	50	50	100	4
4.	IPCC	24CS504	Computer Graphics and Visualization	28	0	28	34	90	50	50	100	3
5.	PCCL	24CS505	Web Programming Laboratory	0	0	28	2	30	50	50	100	1
6.	PEC	24CS56X	Professional Elective Course - I	42	0	0	48	90	50	50	100	3
7.	PI	24CS507	Mini Project	0	0	28	2	30	50	50	100	1
8.	AEC	24RIP	Research Methodology and IPR	42	0	0	48	90	50	50	100	3
9.	HSMC	24EVS	Environmental Studies	0	0	28	2	30	50	50	100	1
10.	NCMC	24NYP3	NSS, YOGA, PE	0	0	0	28	-	50	50	100	AUDIT
Total												**22**

Sl. No.	**Professional Elective Course - I**	
	Course Code	**Course Title**
1.	24CS561	Digital Image Processing
2.	24CS562	Data Mining and Warehousing
3.	24CS563	Internet of Things
4.	24CS564	Advanced Java
5.	24CS565	Advanced Algorithms

SIXTH SEMESTER												
Sl. No	**Course Category**	**Course Code**	**Course Title**	**Teaching Hours per Semester**					**Exam Marks**			**Credits**
				L	**T**	**P**	**TW/SL**	**Total**	**CIE**	**SEE**	**Total**	
1.	IPCC	24CS601	Machine Learning	42	0	28	50	120	50	50	100	4
2.	HSMC	24CS602	Technology Management and Entrepreneurship	28	28	0	34	90	50	50	100	3
3.	PCC	24CS603	System Software and Compiler Design	42	0	0	50	90	50	50	100	3
4.	PCCL	24CS604	Full Stack Web Development Laboratory	0	0	56	4	60	50	50	100	2
5.	PI	24CS605	Main Project Phase - I	0	0	56	4	60	50	50	100	2
6.	PEC	24CS66X	Professional Elective Course - II	42	0	0	48	90	50	50	100	3
7.	OEC	24OECS6X	Open Elective – I	42	0	0	48	90	50	50	100	3
8.	AEC	24CS607X	Ability Enhancement Course	0	0	28	2	30	50	50	100	1
9.	NCMC	24NYP3	NSS, YOGA,PE	0	0	28	2	-	50	50	100	AUDIT
10.	HSMC	24ASK	Analytical skills	0	0	28	2	30	50	50	100	1
Total												**22**

Ability Enhancement Course		
1	24CS607A	Application Development Laboratory
2	24CS607B	Generative AI
3.	24CS607C	Automated Software Testing
4.	24CS607D	Devops

Sl. No.	**Professional Elective Course - II**	
	Course Code	**Course Title**
1.	24CS661	Introduction to Computer Vision
2.	24CS662	Artificial Intelligence
3.	24CS663	Wireless Networks
4.	24CS664	Social Network Analysis
5.	24CS665	Robotic Process Automation

Sl. No.	**Open Electives**	
	Course Code	**Course Title**
1.	24OECS61	Introduction to Cloud Computing
2.	24OECS62	Introduction to JAVA programming
3.	24OECS63	Web Technology

Program Outcome (PO) and Program Specific Outcome (PSO) Mapping

Sl No	Subject Code	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PS01	PS02
1.	24CS501	✔	✔	✔		✔			✔	✔			✔	
2.	24CS502	✔	✔	✔		✔			✔	✔	✔	✔		✔
3.	24CS503	✔	✔	✔		✔			✔	✔				
4.	24CS504	✔	✔	✔		✔			✔	✔			✔	
5.	24CS505	✔		✔		✔							✔	✔
6.	24CS507		✔	✔	✔	✔		✔	✔	✔	✔	✔	✔	✔
7.	24CS561	✔	✔	✔		✔			✔	✔			✔	
8.	24CS562	✔	✔	✔		✔			✔	✔			✔	✔
9.	24CS563	✔	✔	✔		✔			✔	✔				
10.	24CS564	✔	✔	✔		✔	✔		✔	✔			✔	
11.	24CS565	✔	✔	✔		✔			✔	✔			✔	
12.	24RIP	✔	✔	✔	✔	✔		✔		✔		✔		
13.	24EVS						✔	✔	✔	✔				

Sl No	Subject Code	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PS01	PS02
1.	24CS601	✔	✔	✔		✔							✔	✔
2.	24CS602	✔	✔	✔			✔		✔	✔	✔	✔		✔
3.	24CS603	✔	✔	✔		✔							✔	
4.	24CS604			✔	✔	✔			✔	✔	✔	✔	✔	
5.	24CS605	✔	✔	✔	✔	✔	✔		✔	✔	✔	✔	✔	✔
6.	24CS661	✔	✔	✔		✔			✔	✔				
7.	24CS662	✔	✔	✔		✔			✔	✔			✔	
8.	24CS663	✔	✔	✔		✔			✔	✔		✔		
9.	24CS664	✔	✔	✔		✔			✔	✔			✔	✔
10.	24CS665	✔	✔	✔		✔			✔	✔		✔		
11.	24CS607A			✔		✔			✔	✔		✔	✔	✔
12.	24CS607B	✔				✔			✔	✔	✔	✔		
13.	24CS607C	✔	✔	✔		✔				✔	✔	✔	✔	✔
14.	24CS607D	✔	✔			✔							✔	
15.	24OECS61	✔	✔	✔		✔			✔	✔		✔	✔	
16.	24OECS62	✔	✔	✔		✔			✔	✔		✔		
17.	24OECS63	✔	✔	✔		✔	✔		✔	✔				
18.	24NYP3													
19.	24ASK													

Scheme for IV Year

SEVENTH SEMESTER												
Sl. No	**Course Category**	**Course Code**	**Course Title**	**Teaching Hours per Semester**					**Exam Marks**			**Credits**
				L	**T**	**P**	**TW /SL**	**Total**	**CIE**	**SEE**	**Total**	
1.	PCC	24CS701	Cloud Computing	42	0	0	48	90	50	50	100	3
2.	PCC	24CS702	Network Security and Cyber Law	42	0	0	48	90	50	50	100	3
3.	PCC	24CS703	Data Science	42	0	0	48	90	50	50	100	3
4.	PEC	24CS74X	Professional Elective Course - III	42	0	0	48	90	50	50	100	3
5.	PEC	24CS75X	Professional Elective Course - IV	42	0	0	48	90	50	50	100	3
6.	SDC	24CS706	Main Project Phase - II	0	0	8	-	-	100	100	200	4
								Total				**19**

Sl. No.	**Professional Elective Course - III**		**Sl. No.**	**Professional Elective Course - IV**	
	Course Code	**Course Title**		**Course Code**	**Course Title**
1.	24CS741	Deep Learning	1.	24CS751	Pattern Recognition
2.	24CS742	Distributed Computing Systems	2.	24CS752	Big Data Analytics
3.	24CS743	Mobile Communications	3.	24CS753	Block Chain Technology
4.	24CS744	Software Testing	4.	24CS754	Green Computing
5.	24CS745	High Performance Computing	5.	24CS755	Natural Language Processing
6.	24CS746	Bio Inspired System	6.	24CS756	Cyber Security

EIGHT SEMESTER												
Sl. No	**Course Category**	**Course Code**	**Course Title**	**Teaching Hours per Semester**					**Exam Marks**			**Credits**
				L	**T**	**P**	**TW /SL**	**Total**	**CIE**	**SEE**	**Total**	
1.	PEC	24SW01	Professional Elective (Online Course)	42	0	0	48	90	50	50	100	3
2.	OEC	24SW02	Open Elective (Online course)	42	0	0	48	90	50	50	100	3
3.	PI	24INT	Internship (Research / Industry)(14-20 weeks)	0	0	0	-	360	100	100	200	10
								Total				**16**

III Year Syllabus

FIFTH SEMESTER												
Sl. No	**Course Category**	**Course Code**	**Course Title**	**Teaching Hours per Semester**					**Exam Marks**			**Credits**
				L	**T**	**P**	**TW /SL**	**Total**	**CIE**	**SEE**	**Total**	
1.	PCC	24CS501	Finite Automata and Formal Languages	28	28	0	34	90	50	50	100	3
2.	PCC	24CS502	Software Engineering and Project Management	42	0	0	48	90	50	50	100	3
3.	IPCC	24CS503	Computer Networks	42	0	28	50	120	50	50	100	4
4.	IPCC	24CS504	Computer Graphics and Visualization	28	0	28	34	90	50	50	100	3
5.	PCCL	24CS505	Web Programming Laboratory	0	0	28	2	30	50	50	100	1
6.	PEC	24CS56X	Professional Elective Course - I	42	0	0	48	90	50	50	100	3
7.	PI	24CS507	Mini Project	0	0	28	2	30	50	50	100	1
8.	AEC	24RIP	Research Methodology and IPR	42	0	0	48	90	50	50	100	3
9.	HSMC	24EVS	Environmental Studies	28	0	0	2	30	50	50	100	1
10.	MC	24NYP3	NSS, YOGA, PE	0	0	0	28	-	50	50	100	AUDIT
Total												**22**

Sl. No.	**Professional Elective Course - I**	
	Course Code	**Course Title**
1.	24CS561	Digital Image Processing
2.	24CS562	Data Mining and Warehousing
3.	24CS563	Internet of Things
4.	24CS564	Advanced Java
5.	24CS565	Advanced Algorithms

Course Title	FINITE AUTOMATA AND FORMAL LANGUAGES		
Course Code	24CS501	(L-T-P) C	(2-2-0) 3
Exam Hrs.	3	Hours/Week	4
CIE	50 Marks	Total Hours	28L + 28T+24SL+10EV=90
SEE	50 Marks		

Course Objective: To understand and apply automata theory and formal languages for computational problem solving

Course Outcomes (COs): Upon Completion of the course, students shall be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply the knowledge of Automata Theory, Grammars & Regular Expressions to solve problems involving formal languages	1	-
2.	Analyse and verify the given Automata to identify the formal language it represents	2	-
3.	Design automata and grammar for a given formal language.	3	-
4.	Work effectively in a team and demonstrate the working of different automata in real life applications.	5,8,9	1

Course Contents:

MODULE – 1	7 Hrs

Introduction to Finite Automata: Why Study Automata Theory? The Central Concepts of Automata Theory. Finite Automata: An Informal Picture of Finite Automata, Deterministic Finite Automata, Non-Deterministic Finite Automata, Finite Automata with Epsilon-Transitions.

MODULE – 2	7 Hrs

Regular Expressions and Languages: Regular Expressions, Finite Automata and Regular Expressions, Applications of Regular Expressions.
Properties of Regular Languages: Proving Languages Not to Be Regular – Pumping Lemma, Closure Properties of Regular Languages, Equivalence and Minimization of Automata.

MODULE – 3	7 Hrs

Context-Free Grammars and Languages: Context-Free Grammars, Parse Trees, Applications of Context-Free Grammars, Ambiguity in Grammars and Languages.
Pushdown Automata: Definition of the Pushdown Automata, The languages of a PDA, Equivalence of PDA's and CFG's, Deterministic Pushdown Automata.

MODULE – 4	7 Hrs

Properties of Context-Free Languages: Normal Forms for Context-Free Grammars- Eliminating Useless symbols, Eliminating epsilon productions, Eliminating Unit productions, Chomsky Normal Form (CNF), Griebach Normal Form (GNF).
Introduction to Turing Machines: Problems that Computers cannot Solve, The Turing Machine Programming Techniques for Turing Machines.

Text Books

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Introduction to Automata Theory, Languages and Computation	John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman	3rd	Pearson Education	2013

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	An Introduction to Formal Languages and Automata	Peter Linz	4th	Narosa Publishing House	2011
2.	Introduction to Languages and Automata Theory	John C Martin	3rd	Tata McGraw-Hill	2007

EBOOKS/MOOC:

https://methodist.edu.in/web/uploads/files/Introduction%20To%20Automata%20Theory_john%20hopcroft.pdf

Online Courses and Video Lectures:

https://www.youtube.com/watch?v=T5twacMzBFo

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Class Room Teaching & Learning	2	14	28
2.	Tutorial Component	2	14	28
3.	Student Study Hours – Self Learning	-	-	24
4.	Activity Based Learning (ABL1 & ABL2)	-	-	-
5.	Evaluation of Learning Process	-	-	10
			Total Learning Hours / Semester	90

Proposed Assessment Plan (for 50 marks of CIE):

Tool		Remarks	Marks
CIE	CIE1	Conducted for 20 marks and reduced to 10 marks	10
	CIE2	Conducted for 20 marks and reduced to 10 marks	10
	CIE3	Conducted for 20 marks and reduced to 10 marks	10
Activity Details	Activity 1	Design and simulate automata and verify grammar using JFLAP for th real time problems	20
		Total Marks	50

Self-Learning

1. Explore and understand the various simulation tools that can be used to generate automata's
2. Design various automata for real-world scenarios (e.g., traffic light system, vending machine, login validation) using JFLAP or any other tool.
3. Convert regular expressions to DFA/NFA and verify using simulation
4. Design context-free grammars for given languages and validate them
5. Compare DFA vs NFA through examples and simulations in JFLAP
6. Prepare short reports on applications of automata in real-world systems (compilers, AI, networking)

Evaluation of Learning Process

CIE and Activity done using JFLAP

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	3	-	-	2	2	-	-	1	-

Course Title	SOFTWARE ENGINEERING AND PROJECT MANAGEMENT		
Course Code	24CS502	(L-T-P) C	(3-0-0) 3
Exam Hrs.	3	Hours/Week	3
CIE	50 Marks	Total Hours	42L + 28ABL+14SL+6EV=90
SEE	50 Marks		

Course Objective: Use Software Engineering Principles for Application development

Course Outcomes (COs): At the end of course, student will be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply software process models and agile methodologies to real-world software development scenarios and project management	1	2
2.	Analyze software requirements, architectural decisions, and risk management practices to optimize project outcomes	2	2
3.	Design software architectures and detailed project plans using UML and other industry-standard tools	3, 5	2
4.	Collaborative effectively in teams and conduct an activity to simulate professional software development environment and demonstrate the same.	5, 8, 9, 10, 11	2

Course Contents:

MODULE – 1	11 Hrs
Introduction: Professional Software Development, Software Engineering Ethics. Case studies: An insulin pump control system, Software Processes: Software Processes models, Process activities, coping with change, The Rational Unified Process. Agile Software Development: Agile Methods, Plan- driven and Agile Development, Extreme programming. Agile Project Management. Scaling Agile Methods.	
MODULE – 2	**11 Hrs**
Requirements Engineering: Functional and non-functional requirements. The software Requirements Document. Requirements Specification, Requirements Engineering Processes. Requirements Elicitation and Analysis. Requirements validation. Requirements Management. System Models: Context models. Interaction models. Structural models.	
MODULE – 3	**10 Hrs**
Design and Implementation: Object-oriented design using the UML, Design patterns, Implementation issues, Open-source development. Software Testing: Development testing, Release testing, and User testing. Software Evolution: Evolution processes, Program evolution dynamics. Software maintenance, Legacy system management.	
MODULE – 4	**10 Hrs**
Software Project Management: Software Project Management Complexities, Responsibilities of a software project Manager, Project Planning and Metrics for project size estimation, Project estimation techniques, Empirical estimation techniques, Scheduling, Organization and Team Structures.	

Text Books

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Software Engineering (Chapters:1,2,3,4,5,7,8,9)	Ian Sommerville	9th	Person Education	2014
2.	Fundamentals of Software Engineering	Rajib Mall	1st	Prentice-Hall Of India Pvt. Ltd	2015

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Software Engineering - A Practitioners Approach	Roger S. Pressman	7th	McGraw-Hill	2007
2.	Software Engineering Principles and Practice	Waman S. Jawadekar	1st	TMH	2004
3.	Software Engineering: A	Pankaj Jalote	1st	Springer	-

	concise introduction to Software Engineering				

EBOOKS/MOOC:

- https://nptel.ac.in/courses/106/105/106105182/

Online Courses and Video Lectures:

- https://www.coursera.org/specializations/software-engineering
- https://www.edx.org/learn/software-engineering
- https://www.udemy.com/topic/project-management/

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Classroom Teaching & Learning	3	14	42
2.	Student Study Hours – Self Learning	1	14	14
3.	Activity Based Learning (ABL1 & ABL2)	2	14	28
4.	Evaluation of Learning Process	-	-	06
			Total Learning Hours / Semester	**90**

Proposed Assessment Plan (for 50 marks of CIE):

Tool		Remarks	Marks
CIE	**CIE1**	Conduction for 20 marks & reduced to 10 marks	10
	CIE2	Conduction for 20 marks & reduced to 10 marks	10
	CIE3	Conduction for 20 marks & reduced to 10 marks	10
Activity Details	**Activity 1**	Create SRS document for given scenario.	10
	Activity 2	Scrum tool and Version Controller demonstration	10
		Total Marks	**50**

Self-Learning (14 Hours)

- Case Studies- A patient information system for mental health care, A wilderness weather station
- Behavioral models as applied to case study
- COCOMO—A Heuristic Estimation Technique

Activity Based Learning(28 Hours)

1. Requirement specification for (functional and nonfunctional) the specified scenario.
2. Write sequence diagram for the given case.
3. Write a SRS document for the given case study.
4. Write behavioral model and interaction model for the given scenario.
5. By referring to embedded device depict requirement specification.
6. Employ software testing tool to address a given problem.
7. Practice scrum tool for Project management.
8. Develop a simplified version control system that enables tracking of file changes, maintaining version history, and restoring previous versions. The system should support basic operations such as repository initialization, commit, log, and checkout, with optional support for branching and merging.
9. Design and implement a system to manage software defects and feature requests. The system should allow users to report issues, assign priorities, track status, and generate reports for project monitoring.

Evaluation of Learning Process (6 Hours):

Type of Evaluation	**Hours**
CIE (1, 2 and 3)	3
Activity	-
Semester End Exam	3
Total	**06**

Course Articulation matrix													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	2	-	-	-	-	-	-	-	-	-	-	-	3
CO2	-	2	-	-	-	-	-	-	-	-	-	-	3
CO3	-	-	2	-	2	-	-	-	-	-	-	-	3
CO4	-	-	-	-	3	-	-	3	3	3	3	-	3

Course Title	COMPUTER NETWORKS		
Course Code	24CS503	(L-T-P) C	(3-0-2) 4
Exam	3	Hours/Week	5
CIE	50 Marks	Total Hours	42L+28P+28SL+22EV
SEE	50 Marks		

Course Objective: Students will be able to apply data communication principles, network architectures, and communication protocols in computer networks.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply the fundamentals of data communication, network models, and transmission techniques in computer networks.	1	-
2.	Analyze network protocols, switching techniques, routing Mechanism, and layering services in computer networks.	2	-
3.	Design network solutions using IPv4/IPv6 addressing, routing algorithms and appropriate protocols.	3	-
4.	Develop computer network solutions using network protocols, routing algorithms, and network simulation tool.	3,5,8,9	-

Course Contents:

MODULE – 1	11 Hrs
Introduction: Data Communications, Network Types, Network Models: TCP/IP Protocol Suite. Introduction to Physical Layer: Data and Signals, Periodic Analog Signals, Digital Signals, Transmission Impairment, Data Rate limits, Performance. Digital Transmission: Digital-to-Digital Conversion - Line Coding, Line Coding Schemes.	
MODULE – 2	**11 Hrs**
Switching: Introduction, Circuit-Switched Networks, Packet Switching. Introduction to Data-Link Layer: Introduction, Link-Layer Addressing. Error Detection and Correction: Introduction, Block Coding, Cyclic Codes, Checksum, Media Access Control (MAC): Random Access.	
MODULE – 3	**10 Hrs**
Introduction to Network Layer: Network Layer Services, Packetizing, Routing and Forwarding, Packet Switching, Network Layer Performance, IPV4 Addresses – Address Space, Classful Addressing, Classless Addressing, DHCP message format Introduction. Routing Algorithms, Distance vector routing, link state routing, Path vector routing. Multicast Routing: Introduction, Multicasting Basics.	
MODULE – 4	**10 Hrs**
Next Generation IP: IPV6 Addressing, The IPv6 protocol, Transition from IPv4 to IPv6.Transport Layer protocols: Introduction: Services, Port Numbers, User Datagram Protocol (UDP): User Datagram, UDP Services, UDP Applications Transmission Control Protocol: TCP Services, TCP Features, Segment, A TCP Connection, Windows in TCP; Flow Control, Error Control, TCP Congestion Control; TCP Timer and Options;	

Pre-requisite: Basic knowledge of computer fundamentals, digital logic, and programming concepts

Text Books

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Data Communications and Networking,	Behrouz A. Forouzan	5th	Tata McGraw-Hill	

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Communication Networks– Fundamental Concepts and Key architectures	AlbertoLeon-Garcia and Indra Widjaja	2nd	Tata McGraw-Hill	-
2.	Data and Computer Communication	William Stallings	8th	Pearson Education	-
3.	Computer and Communication Networks	Nader F. Mir	-	Pearson Education	2014

EBOOKS/MOOC:

https://www.netacad.com/courses/networking-essentials?courseLang=en-US

Online Courses and Video Lectures:

https://nptel.ac.in/courses/106105183

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Class Room Teaching & Learning	3	14	42
2.	Integrated Lab Component	2	14	28
3.	Student Study Hours – Self Learning	2	14	28
4.	Activity Based Learning		-	-
5.	Evaluation of Learning Process		-	22
Total Learning Hours / Semester				**120**

Proposed Assessment Plan (for 50 marks of CIE):

Tool		Remarks	Marks
CIE	**CIE1**	Conduction for 20 marks & reduced to 10 marks	10
	CIE2	Conduction for 20 marks & reduced to 10 marks	10
	CIE3	Conduction for 20 marks & reduced to 10 marks	10
Activity Details	**Activity 1**	Conduction of lab CIE	10
	Activity 2	Record and Continuous Evaluation	10
Total Marks			**50**

Self-Learning:

Cisco Packet Tracer will be used as a self-learning tool to design, configure, simulate, and troubleshoot computer networks through activities such as IP addressing, routing, switching, VLAN configuration, and network troubleshooting. **Transmission Media** will be used to study and analyze guided and unguided transmission media, enhancing students' practical and analytical networking skills

Evaluation of Learning Process:

Conducting Lab CIE for the listed program

Laboratory Component (if required)

1. Implement of error detection using CRC
2. Write a program to perform Bit Stuffing at the sender and Bit Unstuffing at the receiver
3. Encode data using Hamming Code, detect and correct single-bit errors at the receiver
4. Simulate the transmission of ping messages over a network topology consisting of 6 nodes.
5. Simulate three nodes point– to – point network with duplex links between them. Set the queue size and vary the bandwidth and find the number of packets dropped
6. Simulate five nodes point– to – point network with duplex links between them. Set the queue size and vary the bandwidth and find the number of packets sent with different types of traffic.
7. Implement distance vector algorithm to find the suitable path for transmission between sender and receiver.
8. Simulation of Link State Routing algorithm
9. Simulate an Ethernet LAN using n nodes, change error rate and data rate and compare throughput
10. Simulate an Ethernet LAN using n nodes and set multiple traffic nodes and plot congestion window for different source/destination.
11. Simulate simple ESS and with transmitting nodes in wire-less LAN by simulation and determine the performance with respect to transmission of packets
12. Simulate multicast communication with one sender and multiple receivers, and analyze the packet flow.

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-	-
CO4	-	-	3	-	3	-	-	-	2	2	-	-	-

Course Title	COMPUTER GRAPHICS AND VISUALIZATION		
Course Code	24CS504	(L-T-P) C	(2-0-2) 3
Exam Hrs.	3	Hours/Week	4
CIE	50 Marks	Total Hours	28L + 28P + 34(TW/SL) = 90
SEE	50 Marks		

Course Objective: To learn the concepts of computer graphics to design a 2D and 3D scene usingOpenGL.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply the core concepts of computer graphics to create an image.	1	-
2.	Analyse geometric transformations, projections, and illumination models to render image.	2	-
3.	Design a 2D/3D image using graphical concepts throughOpenGL	3, 5	1
4.	Implement computer graphics applications using OpenGL, document the outcomes and collaborate through team-based activities.	3, 5, 8, 9	1

Course Contents:

MODULE – 1	7 Hrs
Introduction: Applications of computer graphics; A graphics system; Images: Physical and synthetic; Imaging systems; The synthetic camera model; The programmer's interface: Pen Plotter Model, Graphics architectures; **Graphics Programming:** The Sierpinski gasket; Programming two - dimensional applications.	
MODULE – 2	**7 Hrs**
The OpenGL: The OpenGL API; Primitives and attributes; Color; Viewing; Control functions; The Gasket program; Polygons and recursion; The three-dimensional gasket. **Input and Interaction:** Interaction; Input devices; Clients and Servers; Display lists; Display lists and modeling; Programming event-driven input; Menus.	
MODULE – 3	**7 Hrs**
Geometric Objects and Transformations: Three-dimensional primitives; Coordinate systems and frames; Frames in OpenGl; Modeling a colored cube; Affine transformations; Rotation, translation and scaling; Transformations in homogeneous coordinates; Concatenation of transformations; OpenGL transformation matrices.	
MODULE – 4	**7 Hrs**
Viewing: Classical and computer viewing; Viewing with a computer; Positioning of the camera-Positioning of the Camera Frame; Projections in OpenGL. **Lighting and Shading:** Light and Matter; Light Sources; The Phong Lighting Model; Polygonal Shading; Light sources in OpenGL; Specification of materials in OpenGL.	

Pre-requisite: C Programming, Data Structures, 2D and 3D geometry.

Text Books

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Interactive Computer Graphics A Top-Down Approach with OpenGL	Edward Angel	5th	Addison-Wesley	2013

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Computer Graphics Using OpenGL	F.S. Hill,Jr	2nd	Pearson education	2011.

EBOOKS/MOOC:

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Online Courses and Video Lectures:

https://onlinecourses.nptel.ac.in/noc20_cs90

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Class Room Teaching & Learning	02	14	28
2.	Integrated Lab Component	02	14	28
3.	Student Study Hours – Self Learning	-	10	10

4.	Activity Based Learning	-	16	16
5.	Evaluation of Learning Process	-	08	08
			Total Learning Hours / Semester	**90**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	**Remarks**		**Marks**
CIE	**CIE1**	Conducted for 20 Marks (Module 1) & reduced to 10 marks	10
	CIE2	Conducted for 20 Marks (Module 2) & reduced to 10 marks	10
	CIE3	Conducted for 20 Marks (Module 3) & reduced to 10 marks	10
Activity Details	**Activity 1**	Laboratory CIE	10
	Activity 2	Activity Based Learning	10
		Total Marks	**50**

Integrated Laboratory Component

Write C program using OpenGL functions to

1. Create two dimensional sierpinski gasket using bisection method.
2. Recursively subdivide a tetrahedron to from 3D Sierpinski gasket. The number of recursive steps is to be specified by the user.
3. Draw a Rocket and allow the user to change the color.
4. Create robot face using display list.
5. Generate square for right click and to exit for left click using mouse function.
6. Draw box at each location on the screen where the mouse cursor is located.
7. Create hierarchical menus.
8. Create a house like figure and rotate it about a given fixed point using OpenGL functions.
9. Create a Rotating Square.
10. Draw a color cube and spin it using OpenGL transformation matrices.

Self-Learning **10 Hrs**

Programmable pipelines, Animating interactive programs, Interactive Mesh Displays, Shading of sphere models.

Activity Based Learning **16 Hrs**

Create an interactive 2D graphics application using OpenGL and GLUT. The application should employ OpenGL primitives for object creation, support user interaction through input devices, utilize menus or display lists for efficient rendering, apply suitable transformations and projections, and implement a basic lighting model to enhance visualization.

Evaluation of Learning Process

Type of Evaluation	**Hours**
Test (1, 2 and 3)	3
Laboratory CIE (Activity 1)	2
Activity based learning (Activity 2)	2
Self-study component	1
Total	8

Course Articulation matrix

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	3	-	-	-	-	-	-	3	-
CO4	-	-	3	-	3	-	-	3	3	-	-	3	-

Course Title	WEB PROGRAMMING LABORATORY		
Course Code	24CS505	L-T-P-C	(0-0-2) 1
Exam Hrs.	3	Hours / Week	2
CIE	50 Marks	Total Hours	28P+2EV = 30
SEE	50 Marks		

Course Objective: Create web pages with client side and server-side scripting

Course Outcomes (COs): Upon the completion of the course the students will be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	**Apply** HTML/XHTML and CSS concepts to develop web pages**.**	1,5	1, 2
2.	**Design** client and server side scripts using appropriate technologies to create interactive and dynamic web pages.	3, 5	1, 2

Course Contents:

Practice Programs

1.	Create and test an HTML document that describes a table with the following contents: The columns of the table must have the headings “Pine,” “Maple,” “Oak,” and “Fir.” The rows must have the labels “Average Height,” “Average Width,” “Typical Life Span,” and “Leaf Type.” You can make up the data cell values.
2.	Demonstrate a program to display Nested list.

Guided Programs

1.	Create a JavaScript that prompts the user for a number and then counts from 1 to that number displaying only the odd numbers using alert window.
2.	Write a java script to validate the following fields in a registration page Name (should contains alphabets and the length should not be less than 6 characters) Password (should not be less than 6 characters) E-mail(should not contain invalid addresses).
3.	Develop and demonstrate, using JavaScript script, a XHTML document that collects the USN (the valid format is: A digit from 1 to 4 followed by two upper-case characters followed by two digits followed by two upper-case characters followed by three digits; no embedded spaces allowed) of the user. Event handler must be included for the form element that collects this information to validate the input. Messages in the alert windows must be produced when errors are detected.
4.	Design an HTML page that captures and displays the mouse cursor’s position when the user clicks anywhere on the page. Use JavaScript to show: • The x and y coordinates relative to the browser’s client area. • The x and y coordinates relative to the screen.
5.	Create an XHTML page that collects name, email, userId and password. Design an Assistance to a user filling out a form can be provided with an associated text area called help box the content of the help box can change depending on the placement of the mouse cursor.
6.	Develop and demonstrate, using JavaScript, a XHTML document that contains three short paragraphs of text, stacked on top of each other, with only enough space for each showing so that the mouse cursor can be placed over some part of them. When the cursor is placed over the exposed part of any paragraph, it should rise to the top to become completely visible.
7.	Create a simple web application using HTML and PHP to maintain student records stored in a text file. The application should provide an easy-to-use HTML form that allows users to perform the main CRUD operations — add, view, search, and delete student records.
8.	a) Write a PHP program to store current date-time in a COOKIE and display the Last visited on date-time on the web page upon reopening of the same page. b) Write a PHP program to Send SESSION ID to the Browser.
9.	Develop a PHP-based student information dashboard. Each student has a unique name (used as the key in an associative array) and an associated value that could be their age or a descriptor (e.g., "wizard", "hobbit"). Display this information in various sorted orders depending on the administrator’s preference.
10.	+1Write XHTML form and PHP to insert name and age information entered by the user into a table created using MySQL and to display the current contents of this table.

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Laboratory CIE	30
Record	Laboratory Record Submission	10
Continuous Evaluation	Conduction of experiments	10
	Total	**50**

Teaching - Learning – Evaluation Scheme

Sl. No	Teaching - Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Class Room Teaching	2	14	28
2.	Evaluation of Learning Process			2
			Total Learning Hours / Semester	**30**

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	1	-	-	-	3	-	-	-	-	-	-	3	2
CO2	-	-	3	-	3	-	-	-	-	-	-	3	2

Course Title	DIGITAL IMAGE PROCESSING		
Course Code	24CS561	(L-T-P) C	(3-0-0)3
Exam Hrs.	3	Hours/Week	3
CIE	50 Marks	Total Hours	42L + 22ABL+ 20SL+ 6EV=90
SEE	50 Marks		

Course Objective: To study the image fundamentals and mathematical transforms necessary for image processing.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply the fundamental concepts of digital image processing, solve basic image processing problems.	1	-
2.	Analyze image enhancement, restoration, filtering, color processing, and compression techniques.	2	-
3.	Design and implement image processing solutions using histogram processing, filtering, compression, and segmentation.	3,5	1
4.	Implement digital image processing applications using appropriate software tools, document the outcomes and collaborate effectively through team based activities	3,5,8,9	1

Course Contents:

MODULE – 1	11 Hrs
Introduction: Basic concepts, Examples of fields that use Digital Image Processing, Fundamental steps in Digital Image Processing, Components of an Image Processing System. Digital Image Fundamentals: Elements of visual perception. Image sensing and acquisition: Image sampling and quantization. Basic concepts in sampling and quantization, Representing digital images, Spatial and Intensity resolutions, some basic relationships between pixels: An Introduction to the Mathematical tools used in digital image processing.	
MODULE – 2	**10 Hrs**
Intensity Transformations and Spatial Filtering: Background: The basics of intensity transformations and spatial filtering, Some basic intensity transformation functions, Histogram Processing. Fundamentals of spatial filtering: The mechanics of spatial filtering, Spatial correlation and convolution. Image Restoration: A model of the image restoration/degradation process. Noise Models: Spatial and Frequency properties of Noise.	
MODULE – 3	**10 Hrs**
Image Restoration: Some important noise probability density functions, Periodic noise, Estimation of noise parameters, Restoration in the presence of Noise only- Spatial Filtering, Mean Filters. Color Image Processing: Color fundamentals, Color models: The RGB color model. Image Compression: Fundamentals: Coding redundancy, Spatial and Temporal redundancy, Irrelevant information, Measuring image information, Fidelity Criteria.	
MODULE – 4	**11 Hrs**
Image Compression: Some basic compression methods: Arithmetic coding, LZW coding, Bit_Plane coding, Digital image watermarking. Image Segmentation : Fundamentals, Point, Line, and Edge Detection, background, Detection of Isolated Points, Line Detection, Edge Models, Basic Edge Detection: The Image Gradient and its Properties, Gradient Operators, Combining the Gradient with Thresholding, Thresholding: Foundation, The Basics of Intensity Thresholding, The Role of Noise in Image Thresholding, The Role of Illumination and Reflectance in Image Thresholding.	

Pre-requisite (If any): Digital images, pixels, coordinate systems and Linear algebra.

Text Books

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Digital Image Processing	Rafael C. Gonzales, Richard E. Woods	4th	Pearson publications	2018

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Fundamentals of Digital	A.K. Jain	2nd	Pearson	2018

	Image Processing				
2.	Digital Image Processing and Analysis	B. Chanda , Dutta Majumdeer	2nd	Prentice-Hall of India Pvt.Ltd	2011
3.	Introduction to Digital Image Processing with Matlab	Rafael C. Gonzales, Richard E. Woods, Steven L.Eddins	2nd	Mcgraw Higher Ed	2010

EBOOKS/MOOC:

https://www.pearson.com/en-gb/subject-catalog/p/digital-image-processing-global-edition/P200000004313/9781292223070

Online Courses and Video Lectures:

https://nptel.ac.in/courses/117105135

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Class Room Teaching & Learning	03	14	42
2.	Integrated Lab Component	-	-	-
3.	Student Study Hours – Self Learning	-	20	20
4.	Activity Based Learning	-	22	22
5.	Evaluation of Learning Process	-	06	06
			Total Learning Hours / Semester	**90**

Proposed Assessment Plan (for 50 marks of CIE):

Tool		Remarks	Marks
CIE	CIE1	Conducted for 20 Marks (Module 1) & reduced to 10 marks	10
	CIE2	Conducted for 20 Marks (Module 2) & reduced to 10 marks	10
	CIE3	Conducted for 20 Marks (Module 3) & reduced to 10 marks	10
Activity Details	Group activity	Activity Based Learning	20
		Total Marks	**50**

Self-Learning **20Hrs**

Fundamentals of human visual perception in the context of digital image processing, convolution, types of noise (Gaussian and salt-and-pepper), and the importance of spatial filtering in image processing. JPEG compression, and noise probability distributions, gradient-based edge detection techniques and image segmentation methods.

Activity Based Learning **22 Hrs**

1. Demonstrate the effects of sampling, quantization, and pixel relationships in digital images.
2. Design and perform experiments to demonstrate histogram processing and spatial filtering in digital image processing.
3. Design and perform experiments to demonstrate noise handling, color processing, and image compression in digital image processing.
4. Design and perform experiments to demonstrate edge detection, thresholding, and basic object detection in digital image processing.

Evaluation of Learning Process

Type of Evaluation	Hours
Test (1, 2 and 3)	3
Semester End Exam	3
Total	6

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	3	-	-	-	-	-	-	3	-
CO4	-	-	3	-	3	-	-	3	3	-	-	3	-

Course Title	DATA MINING AND WAREHOUSING		
Course Code	24CS562	(L-T-P) C	(3-0-0) 3
Exam Hrs.	3	Hours/Week	3
CIE	50 Marks	Total Hours	42L + 48TW = 90
SEE	50 Marks		

Course Objective: Students will be able to apply appropriate Data mining and warehousing techniques for real time application

Course Outcomes (COs): Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply the fundamentals of data mining and data warehousing to knowledge discovery.	1	-
2.	Analyze datasets to identify and apply appropriate data preprocessing techniques for effective data mining	2	-
3.	Implement classification, clustering, and association analysis techniques to solve data mining problems	3	1
4.	Develop Python programs to implement data mining algorithms for data analysis.	3,5,8,9	2

Course Contents:

MODULE – 1	10 Hrs
Introduction: Data: Why Data Mining? What is Data Mining? What kinds of data can be mined? What kinds of pattern can be mined?, Which technologies are used? Major issues in data mining. Getting to know your data: Data objects and attribute types, Basic statistical description of data: measuring the central tendency, Measuring the dispersion of data, measuring data similarity and dissimilarity	
MODULE – 2	**11 Hrs**
Data Pre-processing: Data Pre-processing: An overview, Data cleaning, Data integration, Data Reduction: overview of data reduction strategies, Principal component analysis, attributes subset selection, Data Transformation: min-max normalization and Z-score normalization. Data Warehouse and online Analytical processing: Data Warehouse: Basic Concepts, Data Warehouse modelling: Data cube and OLAP, Data warehouse design and usage: A business analysis frame work for data warehouse design, Data warehouse design process.	
MODULE – 3	**11 Hrs**
Classification: Preliminaries, General Approach to Solving a Classification Problem, Decision Tree Induction, Rule-based classification, K- Nearest- neighbour Classifier. Mining frequent patterns. Association and correlations: Basic Concepts and Methods: Basic Concepts, Frequent item set mining methods: Apriori Algorithm, generating association rules from frequent item sets, Improving the efficiency of Apriori, A Pattern growth Approach for Mining Frequent item sets.	
MODULE – 4	**10 Hrs**
Cluster Analysis: Basic Concepts and Methods, Cluster Analysis, Partitioning Methods, Agglomerative versus divisive hierarchical clustering, DBSCAN. Data Mining Trends and research frontiers: Data Mining Applications, Data mining and society, Data mining trends	

Pre-requisite: DBMS & SQL, Programming fundamentals, Statistics & linear algebra.

Text Books

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Data Mining – Concepts and Techniques,	Jiawei Han and Micheline Kamber, V	3rd	MK Publishers	2013
2.	Introduction to Data Mining	Pang-Ning Tan, Michael Steinbach, Vipin Kumar	1st	Pearson Education	2014

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Insight into Data Mining – Theory and Practice	K.P. Soman, Shyam Diwakar, V.Ajay 1st PHI	1st	PHI	2006

2.	Introduction to Data Mining with Case Studies	G. K. Gupta	3rd	PHI	2009

EBOOKS/MOOC:

1. http://nptel.ac.in/courses/110106064/
2. http://nptel.ac.in/courses/106106093/
3. https://www.edx.org/course/analytics-for-decision-making

Online Courses and Video Lectures:

Infosys Springboard Course

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Class Room Teaching & Learning	3	14	42
2.	Student Study Hours – Self Learning	1	14	14
3.	Activity Based Learning (ABL1 & ABL2)	-	-	28
4.	Evaluation of Learning Process	-	-	06
			Total Learning Hours / Semester	**90**

Proposed Assessment Plan (for 50 marks of CIE):

Tool		Remarks	Marks
CIE	CIE1	Conduction for 20 marks & reduced to 10 marks	10
	CIE2	Conduction for 20 marks & reduced to 10 marks	10
	CIE3	Conduction for 20 marks & reduced to 10 marks	10
Activity Details	Activity 1	Implement Data mining algorithms for a given scenario using Python - Project based learning	10
	Activity 2	Infosys Springboard Certification	10
		Total Marks	**50**

Self-Learning

Relational databases and SQL fundamentals
Web mining: extracting patterns from online data.
Sequential pattern mining (discovering trends over time).

Evaluation of Learning Process

CIE and Activity evaluation.

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	3	-
CO4	-	-	3	-	3	-	-	2	3	-	-	-	3

Course Title	INTERNET OF THINGS		
Course Code	24CS563	(L-T-P) C	(3-0-0)3
Exam Hrs.	3	Hours/Week	3
CIE	50 Marks	Total Hours	42L+14SL+20ABL+14EV= 90
SEE	50 Marks		

Course Objective: Explore the interconnection, integration of the physical world and design IOT applications.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply IoT principles and protocols to configure endpoint devices for smart object and sensor interaction.	1	-
2.	Analyze IoT architectures, communication technologies, and networking protocols for real-world IoT applications.	2	-
3.	Design end-to-end IoT solutions using sensing, networking, and computing components for real-world applications	3	-
4.	Develop IoT applications using Raspberry Pi, networking protocols, and appropriate IoT development tools.	3,5,8,9	-

Course Contents:

MODULE – 1	10 Hrs
What is IoT, Genesis of IoT, IoT and Digitization, IoT Impact, Convergence of IT and IoT, IoT Challenges, IoT Network Architecture and Design, Drivers Behind New Network Architectures, Comparing IoT Architectures, A Simplified IoT Architecture, IoT Data Management and Compute Stack.	
MODULE – 2	**11 Hrs**
Smart Objects: The "Things" in IoT, Sensors, Actuators, and Smart Objects, Sensor Networks, Connecting Smart Objects: Communications Criteria, IoT Access Technologies: IEEE 802.15.4, IEEE 802.15.4g and IEEE 802.15.4e.	
MODULE – 3	**10 Hrs**
IP as the IoT Network Layer: The Business Case for IP, The need for Optimization, Optimizing IP for IoT, Profiles and Compliances. Application Protocols for IoT: The Transport Layer, IoT Application Transport Methods.	
MODULE – 4	**11 Hrs**
IoT Physical Devices and Endpoints - RaspberryPi: Introduction to RaspberryPi, Exploring the RaspberryPi Board; Operating System setup on RaspberryPi, RaspberryPi commands, Programming RaspberryPi with Python. Smart City Use-Case Examples: Connected Street Lighting, Street Lighting Architecture, Smart Parking, Smart Parking Use Cases, Smart Parking Architecture, Smart Traffic Control, Smart Traffic Control Architecture, Smart Traffic Application.	

Pre-requisite: Knowledge of Computer Networks, Programming Fundamentals and Basic Operating System concepts

Text Books

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things	David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry	1st	Pearson Education (Cisco Press Indian Reprint).	
2.	Internet of Things	Srinivasa K G, Siddesh G M Hanumantha Raju R	1st	CENGAGE Leaning India	2017

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Internet of Things - A Hands on Approach	Arshdeep Bahga and Vijay Madisetti	1st	Universities Press	2015
2.	The Internet of Things: Key Applications and Protocols	Olivier Hersent, David Boswarthick, Omar Elloumi	2nd	Wiley	2012

EBOOKS/MOOC:

https://onlinecourses.nptel.ac.in/noc26_cs37/preview

Online Courses and Video Lectures:

https://www.youtube.com/playlist?list=PL_RcVnBPGmSIce3i6ayTgGjDaHxfVGbH1

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Class Room Teaching & Learning	3	14	42
2.	Integrated Lab Component	-	-	-
3.	Student Study Hours – Self Learning	-	-	14
4.	Activity Based Learning	-	-	20
5.	Evaluation of Learning Process	-	-	14
Total Learning Hours / Semester				**90**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks		Marks
CIE	**CIE1**	Conduction for 20 marks & reduced to 10 marks	10
	CIE2	Conduction for 20 marks & reduced to 10 marks	10
	CIE3	Conduction for 20 marks & reduced to 10 marks	10
Activity Details	**Activity 1**	Group based simulation activity	10
	Activity 2	Demonstration and Presentation of Simulation	10
Total Marks			**50**

Self-Learning

Students independently explore Arduino simulation tools to design and simulate IoT-based applications. They gain hands-on experience in interfacing sensors, actuators, and communication modules while validating system functionality in a virtual environment. This activity enhances practical skills, creativity, and self-directed learning.

Activity Based Learning: Students are evaluated based on their ability to implement IoT concepts using simulation tools and hardware platforms. Assessment includes demonstration of the developed solution, submission of a technical report documenting the implementation and results, and a viva voce to evaluate conceptual understanding and practical skills.

Evaluation of Learning Process (6 Hours)

Type of Evaluation	Hours
Test (1, 2 and 3)	3
Semester End Exam	3
Total	6

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-	-
CO4	-	-	3	-	3	-	-	2	2	-	-	-	-

Course Title	ADVANCED JAVA		
Course Code	24CS564	(L-T-P) C	(3-0-0)3
Exam Hrs.	3	Hours/Week	3
SEE	50 marks	Total Hours	42L + 28ABL+14SL+6EV=90

Course Objective: Students will be able to apply J2EE concepts to create an application.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply Java enumerations, collections, wrapper classes, and event handling concepts to develop modular programs.	1	1
2.	Analyse the given scenarios and use the suitable java constructs and give inference.	2	1,2
3.	Design and implement Java programs to solve real-world problems.	3,5,6	1,2
4.	Collaborate in teams to develop dynamic web applications using Servlets, JSP, and JDBC.	3,5,8,9	1,2

Course Contents:

MODULE – 1	11 Hrs

Enumeration and Autoboxing: Enumeration fundamentals, values() and valuesOf() Methods, Java Enumerations are class types, example, Type Wrappers, Autoboxing and Autounboxing. Event Handling The delegation event model; Event classes; Sources of events; Event listener interfaces; Using the delegation event model; Adapter classes

MODULE – 2	11 Hrs

User Interface components with Swing Components and containers, Layout managers, A first simple swing example, Event Handling, Creating a swing applet, Exploring Swing Controls-JLabel and ImageIcon, Jtextfield The Swing buttons, JTabbedPane, JScrollPane, JList, JCombobox.

MODULE – 3	10Hrs

The Collections Framework – Collections overview, The collection Interfaces, The collection classes, Accessing collection via an iterator. Database Access- The Concept of JDBC, JDBC Driver Types, JDBC Packages, A Brief Overview of the JDBC process, Database Connection, Statement Objects, Result Set

MODULE – 4	10 Hrs

Servlets and JSP - Lifecycle of a sevelet, A simple servlet, The Servlet API, javax.servlet Package, Reading Servlet parameters, The javax.servlet.http Package, Handling HTTP Request and Responses, Using Cookies, Session tracking. Java Server Pages (JSP): JSP, JSP Tags, User Sessions, Cookies, Session Objects. RMI -. Java Remote Method Invocation: Remote Method Invocation concept; Server side, Client side.

Pre-requisite (If any)

- Core Java Programming.
- Object-Oriented Programming (OOP) concepts such as classes, objects, inheritance, polymorphism, abstraction, and encapsulation.

Text Books

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Java The Complete Reference	Herbert Schildt	8th	McGraw Hill	2013
2.	J2EE The Complete Reference	Jim Keogh	-	Tata McGraw Hill	2007

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Advanced Java Programming	Uttam.K.Roy		Oxford Press	2015
2.	Head First Servlets and JSP	Shroff	2nd	O,Reilly Publications	2008

EBOOKS/MOOC:

1. http://www.nptelvideos.com/java/java_video_lectures_tutorials.php
2. https://www.youtube.com/watch?v=0KL_zftem4g/

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Class Room Teaching & Learning	3	14	42
2.	Activity Based Learning	2	14	28
3.	Student Study Hours – Self Learning	1	14	14
4.	Evaluation of Learning Process	-	-	6
			Total Learning Hours / Semester	**90**

Proposed Assessment Plan (for 50 marks of CIE):

Tool		Remarks	Marks
CIE	CIE1	Conducted for 20 marks & reduced to 10 marks	10
	CIE2	Conducted for 20 marks & reduced to 10 marks	10
	CIE3	Conducted for 20 marks & reduced to 10 marks	10
Activity Details	Activity 1	ABL(Group based activity to implement java concepts)	15
	Activity 2		5
		Total Marks	**50**

Activity Based Learning:

- Design and develop an application using Advanced Java concepts such as Swings, Servlets, JSP and JDBC.
- Identify a real-world problem and implement an appropriate solution that integrates backend processing and database connectivity to meet user requirements. Present the solution with proper functionality, usability.

Self- Learning:

Hibernate framework, Spring framework
Practice coding daily on platforms like:

- HackerRank
- LeetCode

Evaluation of Learning Process (6 Hours)

Type of Evaluation	Hours
CIE (1, 2 and 3)	3
Semester End Exam	3
Total	06

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	-	-	-	-	-	-	-	-	-	-	3	-
CO2	-	2	-	-	-	-	-	-	-	-	-	3	2
CO3	-	-	2	-	2	2	-	-	-	-	-	3	2
CO4	-	-	3	-	3	-	-	2	2	-	-	3	2

Course Title	ADVANCED ALGORITHMS		
Course Code	24CS565	(L-T-P) C	(3-0-0) 3
Exam Hrs.	3	Hours/Week	3
CIE	50 Marks	Total Hours	42L + 22ABL+ 20SL+ 6EV =90
SEE	50 Marks		

Course Objective: To study advanced algorithmic techniques and computational methods for solving complex problems in string processing, number theory, graph optimization, and computational geometry.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply asymptotic, recurrence-based, and amortized analysis techniques to evaluate efficiency of algorithm.	1	-
2.	Analyze string matching and number theoretic algorithms to solve computational and cryptographic problems.	2	-
3.	Design solutions for graph optimization, network flow, and signal processing problems using advanced algorithmic techniques.	3, 5	1
4.	Implement computational geometry algorithms for geometric modeling, document outcomes, and collaborate effectively through team-based activities.	3, 5,8,9	1

Course Contents:

MODULE – 1	11 Hrs

Analysis Techniques: Growth functions, Recurrences and solution of recurrence equations; Amortized analysis: Aggregate, Accounting, and Potential methods, String Matching Algorithms: Naive Algorithm; Robin-Karp Algorithm, String matching with Finite Automata, Knuth-Morris-Pratt and Boyer-Moore Algorithms.

MODULE – 2	10 Hrs

Number Theoretic Algorithms: Elementary notions, GCD, Modular arithmetic, Solving modular linear equations, The Chinese remainder theorem, Powers of an element RSA Cryptosystem, Primality testing, Integer factorization, - Huffman Codes, Polynomials. FFT-Huffman codes: Concepts, construction, Proof correctness of Huffman's algorithm; Representation of polynomials, DFT and FFT efficient implementation of FFT,ss

MODULE – 3	11 Hrs

Graph Algorithms, Bellman-Ford Algorithm Shortest paths in a DAG, Johnson's Algorithm for sparse graphs, Flownetworks and the Ford-Fulkerson Algorithm, Maximum bipartite matching. **Computational Geometry-I:** Geometric data structures using, C, Vectors, Points,Polygons, Edges Geometric objects in space.

MODULE – 4	10 Hrs

Computational Geometry-I(Contd…) Finding the intersection of a line and a triangle, Finding star-shaped polygons using incremental insertion. **Computational Geometry-II:** Clipping: Cyrus-Beck and Sutherland-Hodman Algorithms; Triangulating, monotonic polygons; Convex hulls, Gift wrapping and Graham Scan; Removing hidden surfaces.

Prerequisites: Data Structures and Algorithms

Text Books

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Introduction to Algorithms	Thomas H. Cormen et al	-	Prentice Hall India	1990

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
4.	Fundamentals of Computer Algorithms	E. Horowitz, S. Sahni and S. Rajasekaran	2nd	University Press	2007

EBOOKS/MOOC:

-

Online Courses and Video Lectures:

https://www.coursera.org/learn/advanced-algorithms-and-complexity

Teaching -Learning– Evaluation Scheme:				
Sl. No	**Teaching and Learning Method**	**No. of Hours/ Week**	**No. of Weeks**	**Hours/ Semester**
1.	Class Room Teaching & Learning	03	14	42
2.	Integrated Lab Component	-	-	-
3.	Student Study Hours – Self Learning	-	20	20
4.	Activity Based Learning	-	22	22
5.	Evaluation of Learning Process	-	06	06
			Total Learning Hours / Semester	**90**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	**Remarks**		**Marks**
CIE	**CIE1**	Conducted for 20 Marks (Module 1) & reduced to 10 marks	10
	CIE2	Conducted for 20 Marks (Module 2) & reduced to 10 marks	10
	CIE3	Conducted for 20 Marks (Module 3) & reduced to 10 marks	10
Activity Details	**Group activity**	Activity Based Learning	20
		Total Marks	**50**

Self-Learning — **20 Hrs**

1. Students shall independently study any one of the following topics and submit a report/presentation on recent applications of FFT in image and signal processing.
2. Modern cryptographic protocols based on number theory.
3. Geometric algorithms in computer graphics and GIS.
4. Algorithmic challenges in large-scale graph analytics.
5. Applications of network flow algorithms in transportation and communication systems.

Activity Based Learning — **22 Hrs**

1. Performance comparison of string matching algorithms on real datasets.
2. Implementation of RSA cryptosystem and primality testing.
3. Simulation of shortest-path and network flow algorithms.
4. Visualization of FFT and graph algorithms using software tools.
5. Computational geometry mini-project involving convex hulls and clipping algorithms.

Evaluation of Learning Process

Type of Evaluation	**Hours**
Test (1, 2 and 3)	3
Activity based learning	2
Self-study component	1
Total	6

Course Articulation matrix

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	3	-	-	-	-	-	-	3	-
CO4	-	-	3	-	3	-	-	3	3	-	-	3	-

Course Title	MINI PROJECT		
Course Code	24CS507	L-T-P-C	(0-0-2) 1
Exam Hrs.	3	Hours / Week	4
CIE	50 Marks	Total Hours	30
SEE	50 Marks		

Course Objective: To provide students with hands-on experience in identifying, designing, and implementing innovative solutions to real-world problems through mini projects.

Course Outcomes (COs): Upon the completion of the course the students will be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Identify a real-world engineering problem, conduct a comprehensive literature review, and formulate a clear set of project objectives and methodology.	2	1,2
2.	Design and develop a systematic solution, prototype, or model by applying engineering principles, modern tools, and sustainable design methodologies.	3,5	1,2
3.	Test, analyse, and evaluate the performance of the developed solution against the defined objectives to draw validated, data-driven conclusions.	4	1,2
4.	Demonstrate professional ethics, manage project timelines and resources, and communicate the outcomes effectively through a technical report and team presentation.	7,8,9,10,11	1,2

- A team of 3-4 students must develop the mini project. However, during the final evaluation, each student must demonstrate the project individually.
- The team must submit a Project Report (25 to 30 Pages) after completion with the following contents
  - Introduction
  - Requirements
  - System Architecture
  - Implementation
  - Testing
  - Conclusion and Future work
  - References

The project will be evaluated in three phases as outlined below.

Rubrics for Evaluation of Mini Project

Phase I (Project Proposal Submission and Evaluation Scheme):

After finalizing the topic with the guidance of Supervisor, students should submit the project proposal along with Synopsis not exceeding 10 pages. Approval of synopsis is done for 15 marks by concerned project committee.

SI. No	Performance Indicators	Needs Improvement (0-1 mark)	Average	Good	Max marks
1	Literature Survey	Survey of literature is not recent or no (0-1 mark) literature survey	Survey of literature is not clear (2-3 marks)	Literature survey is sufficient. (4-5 marks)	5

2	Synopsis writing	Objective of the work is not identified. (0-3 mark)	Objective of the work is identified but no evidence of Inter disciplinary approach found. (4-7 marks)	Objective of the work is identified with evidence of Inter disciplinary approach found. (8-10 marks)	10
3	Presentation	Contents not delivered completely. (0-1 mark)	Contents not delivered clearly. (2-3 marks)	Contents delivered clearly with confidence. (4-5 marks)	5
TOTAL					20

Phase **II** (Project Demonstration with Report):

Sl. No	**Performance Indicators**	**Needs Improvement**	**Average**	**Good**	**Total marks allocated**
1.	Design and implementation	Not done (0-3 mark)	Incomplete (4-7 marks)	Complete (8-10 marks)	10
2.	Demonstration	Incomplete (0-3 mark)	Complete but not satisfactory. (4-7 marks)	Complete and satisfactory (8-10 marks)	10
3.	Documentation	Organization and clarity of report and technical content is not clear and complete (0-1 mark)	Organization and clarity of report and technical content is clear but not complete (2-3 marks)	Organization and clarity of report and technical content is clear and complete. (4-5 marks)	5
4.	Oral Presentation	Presentation with ppt is not clear (0-1 mark)	Presentation with ppt is clear but not satisfactory (2-3 marks)	Presentation with ppt is clear and satisfactory. (4-5 marks)	5
				Total	30

Semester End Evaluation

Evaluation committee consists of panel of examiners containing external as well as internal evaluators. This evaluation is carried out for 50 marks.

SN	Performance Indicators		Marks allocated	Marks awarded
1.	Project execution	Project specification	5	10
		Progress	5	
2.	Methodology /Result Analysis	System Design	5	15
		System Implementation	5	
		System Testing	5	
3.	Project Report	Organization and Clarity	5	15
		Technical content	5	
		Conclusion and Future Work	5	
			Final presentation	10

		Total	50

Rubrics for Semester End Exam		
SLNO	Marks	Over Criteria
1.	48-50	Project is reaching professional standards.
2.	40-47	Project is excellent and may contain publishable material. Presentation is excellent.
3.	35-39	Project and presentation are very good. All design aims are met.
4.	30-34	Project and presentation are good. Most design aims are met.
5.	25-29	Minimum core of design aims has been met. Presentation is satisfactory.
6.	20-24	Design aims and implementation are met partially. Presentation is moderate.
7.	0-20	Most design aims are not met and implementation does not work. Presentation is not satisfactory.

Proposed Assessment Plan (for 50 marks of CIE):

Tool		**Remarks**	**Marks**
CIE	**Phase-1**	**Evaluation of Phases**	**20**
	Phase-2		**30**

Course Articulation matrix

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	-	3	-	-	-	-	-	-	-	-	-	3	3
CO2	-	-	3	-	3	-	-	-	-	-	-	3	3
CO3	-	-	-	3	-	-	-	-	-	-	-	3	3
CO4	-	-	-	-	-	-	3	3	3	3	3	3	3

Course Title	RESEARCH METHODOLOGY & INTELLECTUAL PROPERTY RIGHTS		
Course Code	24RIP	L-T-P	(3-0-0) 3
Exam Hrs.	3	Hours/Week	3
CIE	50 Marks	Total Hours	42L + 48ABL = 90
SEE	50 Marks		

Course Objective: To give an overview of technical research activities and patenting methodology.
Course outcomes: At the end of course, student will be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Carry out Literature Review and write technical paper	1, 2, 7, 9,11	-
2.	Describe the fundamentals of patent laws and the patent drafting procedure.	2,4,5,7,9,11	-
3.	Elucidate the copyright laws and subject matters of copyright	2,3,4,5,9,11	-

MODULE-1 **10 Hrs.**

Introduction: Meaning of Research, Objectives of Engineering Research, and Motivation in Engineering Research, Types of Engineering Research. **Ethics in Engineering Research:** Ethics in Engineering Research Practice, Types of Research Misconduct, Ethical Issues Related to Authorship.
Literature Review and Technical Reading, New and Existing Knowledge, Analysis and Synthesis of Prior Art, Bibliographic Databases, Web of Science, Google and Google Scholar, Effective Search: The Way Forward, Introduction to Technical Reading Conceptualizing Research, Critical and Creative Reading.

MODULE-2 **10 Hrs.**

Attributions and Citations: Giving Credit Wherever Due, Citations: Functions and Attributes, Impact of Title and Keywords on Citations, Knowledge Flow through Citation, Citing Datasets, Styles for Citations, Acknowledgments and Attributions.
Technical Writing and Publishing : Free Writing and Mining for Ideas, Attributes and Reasons of Technical Writing, Patent or Technical Paper?— The Choice, Writing Journal Paper :Structure and Approach : Title, Abstract, and Introduction, Methods, Results, and Discussions, Table, Figures, Acknowledgments, and Closures

MODULE-3 **11 Hrs.**

Introduction To Intellectual Property: Role of IP in the Economic and Cultural Development of the Society, IP Governance, IP as a Global Indicator of Innovation, Origin of IP, Major Amendments in IP Laws and Acts in India. **Patents:** Conditions for Obtaining a Patent Protection, To Patent or Not to Patent an Invention. Rights Associated with Patents. Enforcement of Patent Rights. Inventions Eligible for Patenting. Non- Patentable Matters. Patent Infringements.
Process of Patenting: Prior Art Search. Choice of Application to be Filed. Patent Application Forms. Jurisdiction of Filing Patent Application. Publication. Pre-grant Opposition. Examination. Grant of a Patent. Validity of Patent Protection. Post-grant Opposition. DoI Need First to File a Patent in India. Patent Related Forms. Fee Structure. Types of Patent Applications.

MODULE-4 **11 Hrs**

Copyrights and Related Rights: Classes of Copyrights. Criteria for Copyright. Ownership of Copyright. Copyrights of the Author. Copyright Infringements. Copyright Infringement is a Criminal Offence. Copyright Infringement is a Cognizable Offence. Copyrights and Internet. Non-Copyright Work. Copyright Registration. Judicial Powers of the Registrar of Copyrights. Fee Structure. Copyright Symbol. Validity of Copyright. Copyright Profile of India. Copyright and the word 'Publish'. Transfer of Copyrights to a Publisher. Copyrights and the Word 'Adaptation'. Copyrights and the Word 'Indian Work'. Joint Authorship. Copyright Society. Copyright Board. Copyright Enforcement Advisory

Council (CEAC).

Trademarks: Eligibility Criteria. Who Can Apply for a Trademark. Acts and Laws. Designation of Trademark Symbols. Classification ofTrademarks. Registration ofa Trademark isNot Compulsory. Validityof Trademark. Types of Trademark Registered in India. Trademark Registry. Process for Trademarks Registration.

Self-study: Case Studies on Patents. Case study of Curcuma (Turmeric) Patent, Case study of Neem Patent, IP Organizations in India.

Text Books:

Sl No	Book Title	Authors	Edition	Publisher	Year
1	Engineering Research Methodology	Dipankar Deb, Rajeeb Dey, Valentina E, Balas	-	Springer	2019
2	Intellectual Property	Prof. Rupinder Tewari, Ms. Mamta Bhardwa	6th	Publication Bureau, Panjab University	2021

Reference Text Books:

Sl No	Book Title	Authors	Edition	Publisher	Year
1	Research Methods for Engineers	DavidV.Thiel	-	Cambridge University Press	2014
2	Intellectual Property Rights	N.K. Acharya	8th	Asia Law House	2021

E Books and online course materials:

1. https://sl1nk.com/y4ggnaa
2. https://dst.gov.in/sites/default/files/E-BOOK%20IPR.pdf

Online Courses and Video Lectures:

1. http://digimat.in/nptel/courses/video/127106227/L05.html
2. https://onlinecourses.swayam2.ac.in/e-learning/preview/aic25_ge09

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Student Study Hours – Self Learning	1	14	14
3	Evaluation of Learning Process	-	-	07
4	Activity Based Learning **(ABL)**	-	-	14+13=27
Total Learning Hours / Semester				**90**

Proposed Assessment Plan (for 50 marks of CIE):

Tool		Remarks	Marks
CIE	CIE1	Conducted for 20 Marks (Module 1) & reduced to 10 marks	10
	CIE2	Conducted for 20 Marks (Module 2) & reduced to 10 marks	10
	CIE3	Conducted for 20 Marks (Module 3) & reduced to 10 marks	10
Activity Details		Details of activities to be conducted Activity 1: Students select any research topic and perform a literature review, identifying existing knowledge, synthesizing prior art, and compiling relevant citations leading to structured survey paper ready for publication.	10
		Activity 2: Students analyze real world case studies for legal issues and propose solutions to infringement cases.	10
		Total Marks	**50**

Activity Based Learning (27 Hours)

ABL 1: Drafting survey paper (14 Hrs.)		
	Research Topic Selection	02

Drafting survey paper	Literature review & Identifying existing knowledge	05
	Synthesizing prior art & compiling relevant citations	04
	Presentation of structured paper	03
ABL 1: Total		**14**
ABL 2: Students analyse real world case studies (13 Hrs.)		
Real world case studies analysis	Legal issues	04
	Propose solutions to infringement cases	04
	Presentation, demonstration, viva-voce	05
ABL 2: Total		**13**
ABL1 + ABL2: Total		**27**
Evaluation of Learning Process (07 Hours)		
Type of Evaluation		**Hours**
CIE (1, 2 and 3)		03
Activity (1 and 2)		01
Semester End Exam		03
Total		**07**

Course Articulation matrix

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	2	2	-	-	-	-	3	-	1	-	2	-	-
CO2	-	2	-	2	2	-	1	-	3	-	1	-	-
CO3	-	3	1	3	2	-	-	-	2	-	2	-	-

Course Title	ENVIRONMENTAL STUDIES		
Course Code	24EVS	L-T-P	(0-0-2) 1
Exam Hrs.	3	Hours/Week	2
CIE	50 Marks	Total Hours	20
SEE	50 Marks		

Course Objective: To create environmental awareness among the students.

Course Outcomes: At the end of the course, student will be able to:

#	Course Outcomes (CO)	Mapping to POs	Mapping to PSOs
1.	Acquire an awareness of sensitivity to the total environment and its allied problems.	7, 9, 11	-
2.	Develop strong feelings of concern, sense of ethical responsibility for the environment and the motivation to act in protecting and improving it.	6, 8	-
3.	Analyze and evaluate environmental measures in real world situations in terms of ecological, political, economical, societal and aesthetic factors.	6, 7, 8, 9	-

MODULE-1	5 Hrs
Environment: Definition, Ecosystem, Balanced ecosystem, Effects of human activities on environment Agriculture Housing Industry Mining and Transportation.	
MODULE-2	**5 Hrs**
Natural Resources: Water resources, Availability and Quality, Water borne diseases, Water induced diseases, Fluoride problem in drinking water. Mineral Resources - Forest Resources - Material Cycles - Carbon, Nitrogen and Sulphur Cycles.	
MODULE-3	**5 Hrs**
Pollution: Effects of pollution - Water pollution - Air pollution Land pollution - Noise pollution.	
MODULE-4	**5 Hrs**
Current Environmental issues of importance: Acid Rain, Ozone layer depletion - Population Growth, Climate change and Global warming. Environmental Impact Assessment and Sustainable Development Environmental Protection - Legal aspects. Water Act and Air Act.	

Text Books:

1. Environmental Studies - Dr. D.L Manjunath, Pearson Education -2006
2. Environmental Studies - Dr. S. M. Prakash - Elite Publishers - 2006

Reference Books:

1. Environmental Studies - Benny Joseph - Tata McGraw ill- 2005
2. Principles of Environmental Science and Engineering P. Venugopala Rao, Prentice Hall of India.

Assessment Strategy

CIE	Schedule	Assessment Method	Marks	Duration (Min.)
CIE I	At the end of 8 weeks	Objective Questions	25	60
CIE II	At the end of 11 weeks	Objective Questions	25	60
Project	At the end of 14 weeks	Project/Presentation/Prototype development/Plantation	50	-

Proposed Assessment Plan (for 50 marks of CIE):

Tool		Remarks	Marks
CIE	CIE1		
	CIE2		
	CIE3		

Activity Details

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	-	-	-	-	3	-	3	-	-	-	-
CO2	-	-	-	-	-	3	-	3	-	-	-	-	-
CO3	-	-	-	-	-	3	3	3	2	-	-	-	-

SIXTH SEMESTER												
Sl. No	**Course Category**	**Course Code**	**Course Title**	**Teaching Hours per Semester**					**Exam Marks**			**Credits**
				L	**T**	**P**	**TW/SL**	**Total**	**CIE**	**SEE**	**Total**	
1.	IPCC	24CS601	Machine Learning	42	0	28	50	120	50	50	100	4
2.	HSMC	24CS602	Technology Management and Entrepreneurship	28	28	0	34	90	50	50	100	3
3.	PCC	24CS603	System Software and Compiler Design	42	0	0	50	90	50	50	100	3
4.	PCCL	24CS604	Full Stack Web Development Laboratory	0	0	56	4	60	50	50	100	2
5.	PI	24CS605	Main Project Phase - I	0	0	56	4	60	50	50	100	2
6.	PEC	24CS66X	Professional Elective Course - II	42	0	0	48	90	50	50	100	3
7.	OEC	24OECS6X	Open Elective – I	42	0	0	48	90	50	50	100	3
8.	AEC	24CS607X	Ability Enhancement Course	0	0	28	2	30	50	50	100	1
9.	MC	24NYP3	NSS, YOGA,PE	0	0	28	2	-	50	50	100	AUDIT
10.	HSMC	24ASK	Analytical skills	0	0	28	2	30	50	50	100	1
Total												**22**

Ability Enhancement Course		
1	24CS607A	Application Development Laboratory
2	24CS607B	Generative AI Tools
3.	24CS607C	Automated Software Testing
4.	24CS607D	Devops

Sl. No.	**Professional Elective Course - II**	
	Course Code	**Course Title**
1.	24CS661	Introduction to Computer Vision
2.	24CS662	Artificial Intelligence
3.	24CS663	Wireless Networks
4.	24CS664	Social Network Analysis
5.	24CS665	Robotic Process Automation

Sl. No.	**Open Electives**	
	Course Code	**Course Title**
1.	24OECS61	Introduction to Cloud Computing
2.	24OECS62	Introduction to JAVA programming
3.	24OECS63	Web Technology

Course Title	MACHINE LEARNING		
Course Code	24CS601	(L-T-P) C	(3-0-2) 4
Exam	3	Hours/Week	5
CIE	50 Marks	Total Hours	42L + 28P+28SL+22EV = 120
SEE	50 Marks		

Course Objective: To apply techniques of machine learning for real time projects.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply preprocessing, Modelling, Evaluation, supervised and unsupervised machine learning algorithms and concept learning for the given problem.	1	-
2.	Analyze the given problem and identify the appropriate data modelling and machine learning methods to solve the same	2	-
3.	Design and develop a machine learning models to solve the given problem	3	1, 2
4.	Conduct experiments to solve given problems using appropriate machine learning techniques	3, 5	1, 2

Course Contents:

MODULE – 1 **11 Hrs**

Introduction to Machine learning: Human learning and its types, Machine learning and its types, Applications, tools and issues in machine learning, Activities in machine learning, Types of data, Exploring structure of data, Data quality and Preprocessing.

Modelling and Evaluation: Introduction, selecting a model, training a model, model representation and interpretability, Evaluating performance of a model.

MODULE – 2 **11 Hrs**

Learning Problems and Concept Learning: Well Posed learning problems, designing Learning systems, Concept Learning Tasks, Search, Find-S, Version Spaces and Candidate Elimination Algorithm, Inductive bias.

Supervised Learning: Introduction, example, classification model, classification learning steps, and Common algorithms – KNN, Decision Tree, and Random Forest model.

MODULE – 3 **10 Hrs**

Supervised Learning (contd..): SVM, Regression-Simple linear regression, Multiple linear regression, Assumptions in Regression analysis.

Unsupervised Learning: Supervised Vs Unsupervised, Application, clustering, finding pattern using Association rule.

MODULE – 4 **10 Hrs**

Basics of Neural Networks: Exploring the artificial neuron, Types of activation function, Early implementations of ANN, Architectures of NN, Learning process in ANN, Backpropagation algorithm.

Bayesian learning: Introduction, Bayes theorem, Bayes theorem and concept learning, Bayesian Belief Networks.

Other types of Learning – Representation learning, Active Learning, Instance based Learning, Association rule Learning, Ensemble learning

Demonstration:

1. Demonstration of Python Libraries for Machine Learning-Pandas, Sklearn, numpy, matplotlib.
2. Demonstration of Exploratory Data Analysis and Data Visualization.

Practical Component:

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
3. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
4. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
5. Implement a clustering algorithm using K-means clustering for the given dataset.

6. Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.
7. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.

Pre-requisite (If any)

Text Books

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Machine Learning	Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das	-	Pearson,	2019
2.	Machine Learning	Tom M. Mitchell	Indian Edition	McGraw-Hill Education	2013

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	The Elements of Statistical Learning	T. Hastie, R. Tibshirani, J. H. Friedman,	1st edition	Springer	2001
2.	Pattern Recognition and Machine Learning	Bishop C.M	-	Springer	2006
3.	Artificial Neural Networks	Yeganarayana B	-	PHI Learning Pvt., Ltd.	-
4.	Introduction to Machine Learning	Ethem Alpaydin	2nd Edition	PHI Learning Pvt. Ltd.	2013

EBOOKS/MOOC:

MOOCS:
1. https://swayam.gov.in/nd1_noc19_cs52/preview
2. https://www.coursera.org/learn/machine-learning/
3. https://nptel.ac.in/courses/106105152

Online Courses and Video Lectures:

https://www.youtube.com/@MaheshHuddar
https://www.coursera.org/learn/machine-learning-with-python

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Class Room Teaching & Learning	3	14	42
2.	Integrated Lab Component	2	14	28
3.	Student Study Hours – Self Learning	2	14	28
4.	Activity Based Learning (ABL1 & ABL2)	-	-	-
5.	Evaluation of Learning Process	-	-	22
			Total Learning Hours / Semester	**120**

Proposed Assessment Plan (for 50 marks of CIE):

Tool		Remarks	Marks
CIE	CIE1	Conducted for 20 marks (Module 1) & reduced to 10 marks	10
	CIE2	Conducted for 20 marks (Module 2) & reduced to 10 marks	10
	CIE3	Conducted for 20 marks (Module 3) & reduced to 10 marks	10
Activity Details	Activity 1	Lab CIE Conducted for 10 marks	10
	Activity 2	Infosys Springboard Certification/ any MOOC Course	10
		Total Marks	**50**

Self-Learning													
Infosys Springboard online course/ any MOOC Course													
Activity Based Learning													
Applied problem solving: Students solve various problems on any online programming													
Evaluation of Learning Process													
Conducting Lab CIE for the listed program													
Course Articulation matrix													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	1	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	2	-	-	-	-	-	-	-	-	3	3
CO4	-	-	2	-	3	-	-	-	-	-	-	3	3

Course Title	TECHNOLOGY MANAGEMENT AND ENTREPRENEURSHIP		
Course Code	24CS602	(L-T-P) C	(2-2-0) 3
Exam Hrs.	3	Hours/Week	4
CIE	50 marks	Total Hours	28L +28T+28ABL+6EV=90
SEE	50 marks		

Course Objective: To lead and manage teams, become entrepreneur and to prepare project proposal

Course Outcomes (COs): Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply knowledge of planning frameworks, human resource organizing, and decision-making matrices to manage technical organizations and resolve structural challenges.	1	-
2.	Analyse product and technology life cycles, research strategies, and Intellectual Property Rights (IPR) to identify issues and formulate creative engineering solutions.	2	2
3.	Design comprehensive project plans and strategic feasibility frameworks that incorporate market demands, technological requirements, and financial constraints.	3	-
4.	Appraise the socio-economic impacts of Small-Scale Industries (SSIs) and global trade policies (GATT/WTO) by collaborating effectively in diverse teams, producing technical project reports, and presenting strategic solutions.	6, 8, 9, 10, 11	-

Course Contents:

MODULE – 1 **7 Hrs**

Planning, and Decision making: Planning: Preview. Nature of planning, the foundation for planning, some planning concepts. Decision Making: Preview .Nature of decision making. Types of decisions/decision making. Some human aspects of organizing: Preview. Staffing technical organizations .Authority and power .Delegation.

MODULE – 2 **7 Hrs**

Motivating & Leading Technical People and Controlling: Motivating and leading technical people: Preview. Motivation. Leadership. Motivating and leading technical professionals (methods). Managing the Research Functions: Preview. Product and technology life cycles .Nature of R&D. Research strategy and organization .Selecting R&D projects .Protection of ideas. Intellectual Property Rights (IPR).Creativity.

MODULE – 3 **7 Hrs**

Entrepreneurship: Meaning Evolution of the concept, functions of an Entrepreneur, Characteristics of an Entrepreneur, types of entrepreneurs, Intrapreneur. Entrepreneurship :Concept of Entrepreneurship, Characteristics of Entrepreneurship ,Development of Entrepreneurship ,Stages in Entrepreneurial process ,Role of Entrepreneurs in economic development, Entrepreneurship in India, Entrepreneurship barriers, Women entrepreneur – Concept & steps to develop Women Entrepreneur. Small Scale Industry: Definition ,Characteristics ,Objectives ,Scope and role of SSI in economic Development, Advantages of SSI, Problems of SSI ,Steps to start an SSI.

MODULE – 4 **7 Hrs**

Government Policy towards SSI; Different Policies of SSI, Introduction to GATT/ WTO. Supporting Agencies of Government for SSI**:** Meaning, Nature of support; Objectives, functions. Ancillary Industry and Tiny Industry. **Institutional Support:** Different Schemes: SSIDC, SSIB, DICs/ Single Window Concept, TCOs, ICICI, NSIC, SIDO, IDBI, SIDBI, SFCS, IFCI. **Preparation of Project:** Meaning, Project identification ,Project selection ,Project Report Need of Project, Contents ;formulation, Network

Analysis Errors of project report ,Project Appraisal ,Feasibility Study, Market Feasibility Study, Technical Feasibility Study ,Financial Feasibility Study ,Social Feasibility Study

Pre-requisite (If any)

Text Books

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	"Managing Engineering and Technology",	Daniel Babcock & Lucy C. Morse	6th edition	PHI,	2014
2.	Management and Entrepreneurship	N. V. RNaidu, T Krishna Rao.	6th	PHI,	2012

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Entrepreneurship Development, Small Business Enterprises	Poornima .M. Charantimath,	5th	Pearson Education	2006.
2.	Dynamics of Entrepreneurial Development &Management	Vasant Desai	4th	Himalaya Publishing House	2002

EBOOKS/MOOC:

1. https://nptel.ac.in/courses/110/106/110106141
2. https://nptel.ac.in/courses/127/105/127105007

Online Courses and Video Lectures:

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Class Room Teaching & Learning	2	14	28
2.	Tutorial	2	14	28
3.	Activity Based Learning (ABL)	2	14	28
4.	Evaluation of Learning Process	-	-	6
	Total Learning Hours / Semester			**90 hours**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks		Marks
CIE	CIE1	Descriptive Questions	10
	CIE2	Descriptive Questions	10
	CIE3	Descriptive Questions	10
Activity Details	Activity 1	Presentation on startups ideas and project proposal	10
	Activity 2	Industry visit with report	10
		Total Marks	**50**

Tutorial- Scenario based Assignment

Self-Learning- NIL

Activity Based Learning :

- Presentation on start-ups ideas and project proposal
- Industry visit with report

Evaluation of Learning Process

- **CIE and Activity marks will be evaluated**

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3		-	-	-	-	-	-	-	-	-	2
CO3	-	-	2	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	3	-	2	2	3	2	-	-

Course Title	SYSTEM SOFTWARE AND COMPILER DESIGN		
Course Code	24CS603	(L-T-P) C	(3-0-0) 3
Exam Hrs.	3	Hours/Week	4
CIE	50 Marks	Total Hours	42L + 50TW/SL=90
SEE	50 Marks		

Course Objective: To understand and apply the concepts of system software and compiler design.

Course Outcomes (COs):

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply the principles of system software and compiler design phases for a given problem	1	-
2.	Analyze the concepts of System software and language processor to process the given input and interpret the features.	2	-
3.	Design assemblers and parsers for the assembly language code.	3	
4.	Implement lexical and syntactic analyzers for the grammars using Lex and Yacc tools.	3, 5	1

Course Contents:

MODULE – 1	11 Hrs
Machine Architecture, Assembler 1: The Simplified Instructional Computer (SIC) and SIC/XE Assemblers: Basic assembler functions, Machine dependent assembler features. Assembler 2: Machine Independent Assembler Features, Assembler Design Options.	
MODULE – 2	**11 Hrs**
Loaders and Linkers: Basic Loader Functions, Machine-Dependent Loader Features, Machine- Independent Loader Features, Loader Design Options. Macro Processor: Basic Macro Processor Functions, Machine-Independent Macro Processor Features.	
MODULE – 3	**10 Hrs**
Introduction: Language Processors, The structure of a Compiler, Applications of Compiler Technology, Programming Language Basics. Lexical Analysis: Role of Lexical Analyzer, Input buffering, Specifications of tokens, Recognition of Tokens.	
MODULE – 4	**10 Hrs**
Syntax Analysis: Introduction, Context –free Grammar and Structure of Language, Parser and its Types, Top-Down parser-Recursive descent parsing and Non-Recursive descent parsing, Predicting parsing table, Error recovering strategies.	

Tutorial

1. a) Write and execute a LEX program to count the number of characters, words, spaces & no. of lines in a given input file.
   b) Write a LEX program to count the number of comment lines in a given C program. Also eliminate them and copy that program into separate file.
2. Write a LEX program to recognize a valid arithmetic expression and to recognize the identifiers and operators present and to print them separately.
3. a) Write a LEX program to recognize and count the number of identifiers in a given input file.
   b) Write a LEX program to find & replace String.
4. a) Write a LEX program to check the validity of a Date.
   b) Write LEX program by reading input file and copy the content with line number to another file.
5. Write YACC program to recognize a valid arithmetic expression that uses operators +, -,* & /.
6. Write YACC program to evaluate an arithmetic expression involving operators +, -, * and /.
7. Write a YACC program to convert infix to postfix.
8. a) Write YACC program to recognize the grammar ($a^n b$, n >= 10).
   b) Write a YACC Program to recognize the grammar ($a^n b^m c^k$, m,n,k >=0 and m=n+k).

Text Books

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	System Software – An	Leland Beck, D. Manjula	3rd	Pearson	2013

	Introduction to Systems Programming				Education	
2.	Compilers- Principles, Techniques and Tools	Alfred V Aho, Ravi Sethi, Jeffrey D Ullman	2nd		Addison-Wesley	2014

Reference Books:

Sl. No	Book Title	Authors	Edition		Publisher	Year
1.	Systems Programming and Operating Systems	D. M. Dhamdhere	2nd		Tata McGraw Hill Company	2009
2.	Lex and Yacc	John. R. Levine, Tony Mason and Doug Brown			O'Reilly, SPD	2012
3.	Principles of Compiler Design	S. V. Raghavan			Tat McGraw Hill Education	2010

EBOOKS/MOOC:

https://freecomputerbooks.com/Compiler-Design-Theory-Tools-and-Examples.html
https://onlinecourses.nptel.ac.in/e-learning/preview/noc21_cs07

Online Courses and Video Lectures:

https://www.coursera.org/learn/formal-languages-and-applications-odc

Teaching -Learning-Evaluation scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ week	No. of Weeks	Hours/ Semester
1.	Class Room Teaching & Learning	2	14	28
2.	Tutorial Component	2	14	28
3.	Student Study Hours – Self Learning			24
4.	Activity Based Learning (ABL1 & ABL2)			
5.	Evaluation of Learning Process			10
			Total Learning Hours / Semester	90

Proposed Assessment Plan (for 50 marks of CIE):

Tool		Remarks	Marks
CIE	CIE1	Conducted for 20 marks(Module 1) & reduced to 10 marks	10
	CIE2	Conducted for 20 marks(Module 2) & reduced to 10 marks	10
	CIE3	Conducted for 20 marks(Module 3) & reduced to 10 marks	10
Activity Details	Activity 1	Develop two pass assembler for a given program using Simulator.	10
	Activity 2	Implement and execute programs using Lex and Yacc for Lexical and Syntactic analysis.	10
		Total Marks	**50**

Self-Learning

1. Explore SIC/XE architecture and simulate sample assembly programs using SIC/XE Simulator or MARS. Prepare symbol tables and object code manually for simple programs.
2. Study dynamic linking and loading mechanisms used in modern operating systems. Analyze macro expansion in C preprocessor and compare with macro processors.
3. Install Lex/Flex tools and develop simple token recognizers for identifiers, keywords, comments, and operators.
4. Implement parsers for arithmetic expressions using Yacc/Bison.
5. Explore online parser generators and visualize parse trees for various context-free grammars using parser visualization tools.

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-	-

CO3	-	-	2	-	-	-	-	-	-	-	-	-	-
CO4	-	-	2	-	3	-	-	-	-	-	-	2	-

Course Title	FULL STACK WEB DEVELOPMENT LABORATORY		
Course Code	24CS604	(L-T-P) C	(0-0-4) 2
Exam Hrs.	3	Hours/Week	4
CIE	50 Marks	Total Hours	56P+ 4EV= 60
SEE	50 Marks		

Course Objective: To build functional, cross platform web applications.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Execute full-stack web development lab programs, analyse the results obtained, and document the findings in technical laboratory records.	3, 9	-
2.	Investigate a real-world problem and develop a full-stack web application as a team-based mini project using appropriate modern development tools, planned milestones, and self-directed learning.	4, 5, 8, 10, 11	1

Course Contents:

1.
(a) Build a Node.js server using Express.js that handles HTTP requests (GET, POST) and responds with JSON data, and extend it by integrating a database such as SQLite or MongoDB to implement full CRUD operations on a dataset.
(b) Build a simple frontend page that consumes this API using fetch/axios, displaying the retrieved data and allowing a new record to be added through a form.

2.
(a) Design and implement a RESTful API using Node.js, Express, and a database of your choice. Define endpoints for managing resources, such as creating, reading, updating, and deleting data.
(b) Test all endpoints using Postman/Thunder Client and add request validation and proper error handling (e.g., 400 for bad input, 404 for missing resources).

3.
(a) Create a library of reusable React components. Build components like buttons, cards, and modals and use them in a sample React application.
(b) Use React Router to build a multi-page demo app that navigates between separate pages showcasing each component.

4.
(a) Write a program to create a simple calculator application using React JS.
(b) Build a second small app — a live digital clock or counter — using React Hooks (useState, useEffect) to reinforce state and lifecycle concepts.

5.
(a) Build a real-time chat application using React for the front end and Node.js with Socket.IO for the back end. Enable users to send and receive messages in real-time.
(b) Extend the chat app to persist messages using MongoDB (via Mongoose) so chat history survives a page refresh.

6.
(a) Develop a Django app that displays the current date and time on the server.
(b) Extend the app to display the date/time in multiple timezones (e.g., IST, GMT, EST) selected via a URL parameter or dropdown, using Django's timezone utilities.

7.
(a) Develop a Django app that performs user registration and login. It should allow users to register, login, and view a welcome page after login using Django authentication.
(b) Extend the same functionality using Django REST Framework, exposing registration/login as API endpoints that return a success/token response.

8.
(a) Develop a simple Django app that displays an unordered list of fruits and an ordered list of selected students for an event.
(b) Extend the app using a Django Form so users can dynamically add a new fruit or student to the list instead of it being hardcoded.

9. Develop a Django app that manages employee records. It should allow adding new employees and display the list of all employees. Create an Employee model with fields name, designation, and salary.

10. Develop a Django app that performs student registration on a course. It should also display a list of students registered for any selected course. Create students and course as models with enrolment as a many-to-many field.

Pre-requisite : Basic knowledge of HTML, CSS, JavaScript and Fundamentals of Database Management Systems (SQL queries)

Text Books

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Full Stack Development with MERN	Vasan Subramanian	1st	Packt Publishing	2019
2.	Django 4 By Example	Antonio Melé	4th	Packt Publishing	2022

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Modern Full-Stack Development	Frank Zammetti	1st	Apress	2023

EBOOKS:

1. Jon Duckett, "JavaScript & jQuery: Interactive Front-End Web Development", Wiley, 2014.
2. Vasan Subramanian, Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node. Apress, 2019.

Online Courses and Video Lectures:

1. https://www.coursera.org/specializations/full-stack-react
2. https://www.udemy.com/course/mern-stack-front-to-back/
3. https://docs.djangoproject.com/en/6.0/

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Laboratory	2	14	28
2.	Student Study Hours – Self Learning	-	-	-
3.	Activity Based Learning	2	14	28
4.	Evaluation of Learning Process	-	-	4
			Total Learning Hours / Semester	**60**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks		Marks
CIE	**CIE1**	Lab CIE	10
	CIE2	Lab CIE	10
	Report	Submission of record	10
Activity Details	**Activity**	Design and Development of a Mini Full Stack Application	20
		Total Marks	**50**

Activity Based Learning

Develop a full-stack web application that integrates frontend and backend technologies to manage users and data end-to-end.

The system should ensure:

- Full CRUD operations with proper data handling and storage

- Secure user authentication and input/form validation
- Interactive and reusable UI components
- Seamless integration between frontend and backend, with tested API endpoints
- (Optional) Real-time features such as live updates or notifications

Evaluation of Learning Process

Evaluates full-stack application development based on CRUD completeness, authentication and validation, API reliability, integration, and interactive user experience.

Course Articulation matrix

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	-	-	2	-	-	-	-	-	3	-	-	-	-
CO2	-	-	-	2	3	-	-	3	-	2	2	3	-

Course Title	MAIN PROJECT PHASE - I		
Course Code	24CS605	(L-T-P) C	(0-0-4) 2
Exam Hrs.	3	Hours/Week	4
CIE	50 Marks	Total Hours	56P+04EV=60
SEE	50 Marks		

Course Objective: To be able to identify a relevant problem that requires technical solution and conduct survey for the same.

Course Outcomes (COs): Upon completion of the course the students will be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Identify a real-life problem, through Extensive literature Survey leading to publication of a survey paper.	1, 2, 4, 6	1
2.	Plan & design the feasible solution to the chosen problem.	3, 5, 6	1
3.	Collaborate and contribute to the teams to work effectively and present the work carried out and prepare the report	8, 9, 10	2
4.	Plan and manage the project and follow the schedules to meet the deadlines	10, 11	2

Course Contents:

During VI semester, candidates in consultation with the guides shall carry out a literature survey to finalize the topic of the project. ***The same project will be continued in Seventh semester***. Students are expected to present the project synopsis, system analysis, requirements specification and ***should publish a technical paper on the Literature Survey. The evaluation will be carried out in three stages***

- Project Phase 1 – Team Formation, Topic Selection & Guide allotment (No marks)
- Project Phase 2 – Extensive Literature Survey, Problem Definition
- Project Phase 3 – Preliminary Design, Report Preparation and Publication

The evaluation of the project phases shall be carried out by the evaluation committee comprising of project guide & other faculty members. The committee will be constituted by the project coordinator in consultation with the Head of the department. ***For Multidisciplinary projects guides will be allotted from each concerned branch.***

Phase 2

Literature Survey and Problem Definition (20 Marks)	Literature Survey not pertaining to the title of the project (0-8)	Incomplete literature survey and improper problem definition (9-14)	Extensive literature survey with clear state-of-the-art problem definition (15-20)
Preliminary Design (10 Marks)	Has no coherent strategies for problem Solving (0-4)	Has some strategies for problem – solving, but does not apply them consistently (5-7)	Formulates strategies for solving problems (8-10)
Group Participation(5)	Contributed less than peers; primarily listened without actively participating. Shared no ideas, which were often not aligned with the project (1-2)	Contributed nearly as much as others. They took part in discussions and occasionally offered suggestions. Consistently completed assigned tasks on time. (3-4)	Consistently completed their share of the work, going above and beyond—and willingly offered assistance to others. Contributed numerous valuable ideas, inspired peers, and communicated thoughts and needs effectively. Completed assigned tasks ahead of schedule (5)
Ethics(5)	Upholds the standards	Upholds the standards of honesty and integrity. Addressed few societal and environmental issues (3-4)	Upholds the standards of honesty and integrity. Addressed the society and environmental issues and responsibilities. (5)

Presentation (10 marks)	Disorganized and ineffective presentation (0-4)	Organized, but ineffective presentation (5-7)	Effectively organized presentation (8-10)
Report Preparation (20 Marks)	Disorganized and contents are not sufficient (0-8)	Organized but not good content wise (9-14)	Effectively organized and well framed contents (15-20)
Paper Publication (20 Marks)	Paper submitted & awaiting results (0-8)	National conference International Conference (9-14)	Journal (15-20)
Punctuality (Project Dairy Maintenance) (10 marks)	Not meeting the guide regularly (0-4)	Meeting regularly but doesn't document details of every session (5-7)	Up to date dairy maintenance (8-10)

Proposed Assessment Plan (for 50 marks of CIE):

Tool	**Remarks**		**Marks**
CIE	**CIE1**	Phase 1 evaluation will be conducted for 40 marks and scale down to 20 marks.	20
	CIE2	Phase 2 evaluation will be conducted for 60 marks and scale down to 30 marks.	30
		Total Marks	50

Course Articulation matrix

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3	3	-	3	-	3	-	-	-	-	-	3	-
CO2	-	-	3	-	3	3	-	-	-	-	-	3	-
CO3	-	-	-	-	-	-	-	3	3	3	-	-	3
CO4	-	-	-	-	-	-	-	-	-	3	3	-	3

Course Title	INTRODUCTION TO COMPUTER VISION		
Course Code	24CS661	L-T-P-C	(3-0-0) 3
Exam Hrs.	3	Hours / Week	3
CIE	50 Marks	Total Hours	42L + 48TW = 90
SEE	50 Marks		

Course Objective: To learn basic principles of image formation, image processing algorithms and different algorithms for recognition from single or multiple images (video).

Course Outcomes (COs): Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply mathematical, geometric, and linear filtering principles to calculate camera parameters and analyze image formation from single or multiple images.	1	-
2.	Identify, formulate, and analyze complex vision problems in image segmentation, tracking, and object recognition to arrive at substantiated engineering conclusions	2	-
3.	Design creative computer vision solutions for motion computation, shape analysis, and object detection while considering public safety, societal, and environmental sustainability factors	3	-
4.	Develop and demonstrate computer vision solutions for real-world problems by working effectively in collaborative teams, utilizing modern engineering tools, and delivering inclusive technical presentations	5,8,9	-

Course Contents:

MODULE – 1	11 Hrs
Introduction and Image Formation: What is computer vision? A brief history, Geometric primitives and transformations, Photometric image formation, The digital camera. Pinhole Perspective, Weak Perspective, Cameras with Lenses, The Human Eye, Intrinsic Parameters and Extrinsic Parameters, Geometric Camera Calibration.	
MODULE – 2	**11 Hrs**
Early Vision – One Image: Linear Filters and Convolution, Shift Invariant Linear Systems, Spatial Frequency and Fourier Transforms, Sampling and Aliasing, Filters as Templates, Local Image Features, Texture.	
MODULE – 3	**10 Hrs**
Early Vision – Multiple Images: Stereopsis and Structure from Motion Early Vision – Mid-level Vision: Segmentation by Clustering, Grouping and Model fitting, Tracking.	
MODULE – 4	**10 Hrs**
High-level Vision: Registration, Smooth Surface and their Outlines, Range Data Detecting Objects in Images, Recognition.	

Pre-requisite (If any)

Text Books

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Computer Vision: Algorithms and Applications (CVAA)	Richard Szeliski	2nd	Springer, http://szeliski.org/Book/	2020
2.	Computer Vision – A modern approach	by D. Forsyth and J. Ponce	2nd	Prentice Hall	2012

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Digital Image Processing	R. C. Gonzalez, R. E. Woods.		Addison Wesley Longman, Inc.	1992
2.	Computer Vision	D. H. Ballard, C. M. Brown		Prentice-Hall, Englewood	1982

				Cliffs	
3.	Image Processing, Analysis, and Machine Vision.	Sonka, Hlavac, and Boyle.		Thomson	
4.	Computer Vision: Models, Learning, and Inference	Simon J. D. Prince		Cambridge University, Press	2012
5.	Introductory Techniques for 3D Computer Vision	E. Trucco and A. Verri,		Prentice Hall	
6.	Building Computer Vision Applications Using Artificial Neural Networks - With Step-by-step Examples in Opencv And Tensorflow With Python,	Shamshad Ansari,Apress,			2020

EBOOKS/MOOC:

Online Courses and Video Lectures:

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Class Room Teaching & Learning	3	14	42
2.	Integrated Lab Component	-	-	-
3.	Student Study Hours – Self Learning	1	14	14
4.	Activity Based Learning (ABL1 & ABL2)	2	14	28
5.	Evaluation of Learning Process	-	-	6
			Total Learning Hours / Semester	**90**

Proposed Assessment Plan (for 50 marks of CIE):

Tool		Remarks	Marks
CIE	CIE1	Conducted for 20 marks & reduced to 10 marks	10
	CIE2	Conducted for 20 marks & reduced to 10 marks	10
	CIE3	Conducted for 20 marks & reduced to 10 marks	10
Activity Details	Activity 1	Real time scenarios activity and simulation of search algorithms by visualization	20
		Total Marks	**50**

Self-Learning

Suggested to take Online courses related to Computer Vision

Activity Based Learning

Real world scenarios based activity and search algorithm simulation visualization.

Evaluation of Learning Process

Demonstration of the work and make all the work available in the open sources

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	3	-	-	-	-	-	-	-	-	-	-

CO3	-	3	-	-	-	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	-	-	-	-

Course Title	ARTIFICIAL INTELLIGENCE		
Course Code	24CS662	(L-T-P) C	(3-0-0) 3
Exam Hrs.	3	Hours/Week	3
CIE	50 Marks	Total Hours	42L + 48ABL = 90
SEE	50 Marks		

Course Objective: Students will be able to apply the concepts of Artificial intelligence to construct knowledge-based systems.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply various search strategy and learning algorithms to a given problem	1	-
2.	Analyze different types of Artificial Intelligence agents and various search strategies to trace their execution and evaluate effectiveness.	2	-
3.	Design intelligent agents by applying rational agent architectures, search algorithms, knowledge representation, logical inference and machine learning techniques for solving a real world problem.	3	-
4.	Demonstrate collaborative team work by implementing various learning techniques to improve decision-making and communicate the same through report and presentation.	3,5,8,9	1

Course Contents:

MODULE – 1	11 Hrs

Introduction: What is AI? Intelligent Agents: Agents and environment; Good behavior: The Concept of Rationality; The nature of environment; The structure of agents. Problem-solving: Problem-solving agents. Example problems; Searching for solution; Uninformed search strategies: Breadth-first search, Uniform- cost search.

MODULE – 2	11 Hrs

Uninformed search strategies: Depth-first search, Depth-limited search, Iterative deepening depth first search, Bidirectional search, Comparing uninformed search strategies; Informed (Heuristic) Search Strategies: Greedy best-first search, A* search, Optimality of A*, Memory-bounded heuristic search; Heuristic functions; Local Search Algorithms and Optimization Problems: Hill-climbing search, Simulated annealing, Local beam search, Genetic algorithms.

MODULE – 3	10 Hrs

On-line search agents and unknown Environments: Online search problems, Online search agents, online local search, learning in online search, Logical Agents: Knowledge-based agents; The Wumpus world; First-Order Logic: Representation revisited; Syntax and semantics of first-order logic; Using first-order logic, Knowledge engineering in first-order logic, Forward Chaining.

MODULE – 4	10 Hrs

Learning from Examples: Forms of Learning; supervised learning; Learning decision trees; Practical Machine Learning. Statistical and Reinforcement learning: Statistical learning, maximum likelihood parameter learning, Bayesian parameter, learning, passive reinforcement learning, active reinforcement learning.

Pre-requisite:

Text Books

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Artificial Intelligence - A Modern Approach	Stuart Russell and Peter Norvig	Third edition	Pearson	2014
2.					

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Artificial Intelligence	Elaine Rich, Kevin Knight and Shivashankar B Nair,	Third edition	McGraw- Hill Education	2015
2.	Introduction to Artificial Intelligence and Expert Systems	Dan W Patterson	-	Pearson	2015

EBOOKS/MOOC:

https://nptel.ac.in/courses/106102220

Online Courses and Video Lectures:

https://www.udemy.com/course/the-ai-engineer-course-complete-ai-engineer-bootcamp/?couponCode=KEEPLEARNING

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Class Room Teaching & Learning	3	14	42
2.	Integrated Lab Component	-	-	-
3.	Student Study Hours – Self Learning	1	14	14
4.	Activity Based Learning	2	14	28
5.	Evaluation of Learning Process	-	-	6
Total Learning Hours / Semester				**90**

Proposed Assessment Plan (for 50 marks of CIE):

Tool		Remarks	Marks
CIE	**CIE1**	Conducted for 20 marks(Module 1) & reduced to 10 marks	10
	CIE2	Conducted for 20 marks(Module 2) & reduced to 10 marks	10
	CIE3	Conducted for 20 marks(Module 3) & reduced to 10 marks	10
	Activity 1	Real world scenarios based activity and search algorithm simulation visualization.	20
Total Marks			**50**

Self-Learning ()

Suggested to take Online courses related to AI

Activity Based Learning ()

Real world scenarios based activity and search algorithm simulation visualization.

Evaluation of Learning Process (6 Hours)

Demonstration of the work and make all the work available in the open sources

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	2	-	-	-	-	-	-	-	-	-	-
CO4	-	-	3	-	3	-	-	3	3	-	-	2	-

Course Title	WIRELESS NETWORKS		
Course Code	24CS663	(L-T-P) C	(3-0-0) 3
Exam Hrs.	3	Hours/Week	3
CIE	50 Marks	Total Hours	42L+ 14SL+28ABL+6EV = 90
SEE	50 Marks		

Course Objective: Apply the principles, algorithms, and methodologies of wireless communication networks to analyze communication scenarios.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply the concepts of wireless communication and transmission techniques to wireless network communication scenarios.	1	-
2.	Analyze the architecture, operation, and mobility management mechanisms of cellular communication systems to optimize network performance.	2	-
3.	Design mobile computing solutions by considering resource management, mobility, bandwidth utilization, and security issues	3	-
4.	Collaborate in teams to develop and present network projects, focusing on optimized solution for wireless communication.	5, 8, 9, 11	-

Course Contents:

MODULE – 1	11 Hrs

Introduction: Wired Network vs. Wireless Network, Overview of Wireless Applications, Wireless Transmission: Path loss, Multi-path propagation, Doppler shift, Fading, Time Division Multiplexing, Frequency Division Multiplexing, Code, Spread Spectrum Technique, Satellite Communication.

MODULE – 2	11 Hrs

Cellular System: Cellular Network Organization, Cellular System Evolution, Cellular Fundamentals: Capacity, Topology, Operation of Cellular Systems, Handoff, Power control, Case study: Global System for Mobile communication (GSM) Network, General Packet Radio Service (GPRS), Code Division Multiple Access (CDMA 2000), Cordless System, Wireless Local Loop, Mobility Management-Location Management, HLR-VLR scheme, Hierarchical scheme, Predictive location management schemes.

MODULE – 3	10 Hrs

Wireless Network: Protocols: Media Access Protocol, Mobile IP, Mobile Transport Layer Protocol, Wireless Access Protocol, Ad-Hoc Networks and Routing, Standards: IEEE 802.11, Wi-Fi, Wireless Broadband-Wi-MAX, Bluetooth, IEEE 802.15, Security in Wireless Network, Hyper LAN

MODULE – 4	10 Hrs

Mobile Computing: Mobile Computing, Issues: Resource Management, Interference, Bandwidth, Cell Splitting, Frequency reuse, Mobile Data Transaction Models, File Systems, Mobility Management, Security.

Pre-requisite: Knowledge on Computer Networks

Text Books

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Wireless Communications & Networks	William Stallings	2	Pearson Education India	2007
2	Mobile Communications	Jochen Schiller	2	Pearson Education India	2007

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	The Wireless Application Protocol	Sandeep Singhal	-	Addison Wesley	2011
2	Wireless Communications: Principles & Practice	T S Rappaport	2	Pearson Education	2002

EBOOKS/MOOC:

https://onlinecourses.nptel.ac.in/noc20_ee61/preview

Online Courses and Video Lectures:

https://onlinecourses.nptel.ac.in/noc20_ee61/preview

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Class Room Teaching & Learning	3	14	42
2.	Integrated Lab Component	-	14	
3.	Student Study Hours – Self Learning	1	14	14
4.	Activity Based Learning	-	-	28
5.	Evaluation of Learning Process	-	-	06
Total Learning Hours / Semester				**90**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks		Marks
CIE	**CIE1**	Conducted for 20 marks(Module 1) & reduced to 10 marks	10
	CIE2	Conducted for 20 marks(Module 2) & reduced to 10 marks	10
	CIE3	Conducted for 20 marks(Module 3) & reduced to 10 marks	10
Activity Details	**Activity 1**	Execution and documentation of programs listed in self-study and ABL	20
Total Marks			**50**

Self-Learning ()

Develop a simulation to analyze path loss, free-space propagation, and fading for different transmission distances and frequencies. Compare the results graphically.

Simulate a GSM cellular network with multiple users moving between cells and study handoff performance, throughput, and packet loss.

Simulate Wi-Fi (IEEE 802.11) communication under varying numbers of users and compare throughput, delay, and packet delivery ratio.

Create a Bluetooth Personal Area Network (PAN) and evaluate communication range, packet transmission, and power consumption.

Develop a program to visualize cell splitting and frequency reuse in a cellular network. Analyze how system capacity changes with different cluster sizes.

Activity Based Learning ()

1. Design a wireless network for a small campus (library + classroom building). The system should support multiple users with secure access, and the performance (connectivity and throughput) must be analyzed under different user loads.
2. Simulate a Mobile Ad Hoc Network and compare AODV and DSR routing protocols based on packet delivery ratio, delay, and routing overhead under node mobility.

Evaluation of Learning Process (6 Hours)

Type of Evaluation	Hours
Test (1, 2 and 3)	3
Semester End Exam	3
Total	6

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	2	2	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	3	-	-	3	3	-	3	-	-

Course Title	SOCIAL NETWORK ANALYSIS		
Course Code	24CS664	(L-T-P) C	(3-0-0) 3
Exam Hrs.	3	Hours/Week	3
CIE	50 Marks	Total Hours	42L + 28ABL+14SL+6EV=90
SEE	50 Marks		

Course Objective: To provide students with a comprehensive understanding of social network analysis, network growth models, link analysis, and community detection techniques for analyzing and solving real-world network problems.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply link analysis techniques, PageRank, similarity measures, and basic link prediction methods to analyze social networks.	1	1
2.	Analyze the characteristics and growth models of social networks and compare different network models.	2	1
3.	Design social network analysis models to identify influential nodes and communities.	3,5	1
4.	Collaborate in teams to evaluate community detection techniques and interpret the structure of complex social networks for practical applications	5,8,9	1,2

Course Contents:

MODULE – 1	11 Hrs
Networks and Society - What is Social Network Analysis, why do We Study Social Networks, Applications of Social Network Analysis, Preliminaries, Three Levels of Social Network Analysis. Network Measures - Network Basics, Node Centrality, Assortativity, Transitivity and Reciprocity, Similarity.	
MODULE – 2	**11 Hrs**
Network Growth Models: Properties of Real-World Networks, Random Network Model, Ring Lattice Network Model, Watts–Strogatz Model, Preferential Attachment Model, Local-World Network Growth Model, Comparison of Network Models, Applications of Network Growth Models.	
MODULE – 3	**10 Hrs**
Link Analysis - Applications of Link Analysis, Signed Networks, Strong and Weak Ties, Link Analysis Algorithms, PageRank, Personalised PageRank, Similarity Measures, Recommendation Systems Basic Introduction to Link Prediction.	
MODULE – 4	**10 Hrs**
Community Structure in Networks - Applications of Community Detection, Types of Communities, Community Detection Methods, Disjoint Community Detection, Overlapping Community Detection, Local Community Detection, and Community Detection vs Community Search, Evaluation of Community Detection Methods.	

Pre-requisite: Fundamentals of Discrete Mathematics (Graph Theory), Basic knowledge of Data Structures and Algorithms. Fundamentals of Probability and Statistics.

Text Books

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	**Social Network Analysis**	**Tanmoy Chakraborty**	**1st**	**Wiley India Pvt. Ltd**	**2021**
2.	**Networks: An Introduction**	**Mark Newman**	**1st**	**Oxford University Press**	**2010**

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Network Science	Albert-Laszlo Barabas	1st	Cambridge University Press	2016
2.	Social Network Analysis: Methods and Applications	Stanley Wasserman, Katherine Faus	1st	Cambridge University Press	1994

EBOOKS/MOOC:

https://networksciencebook.com/
https://onlinecourses.nptel.ac.in/noc22_cs117/preview

Online Courses and Video Lectures:

- https://social-network-analysis.in/
- https://www.coursera.org/learn/social-network-analysis

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Class Room Teaching & Learning	3	14	42
2.	Integrated Lab Component	-	-	-
3.	Student Study Hours – Self Learning	1	14	14
4.	Activity Based Learning	2	14	28
5.	Evaluation of Learning Process	6	-	06
Total Learning Hours / Semester				**90**

Proposed Assessment Plan (for 50 marks of CIE):

Tool		Remarks	Marks
CIE	CIE1	Conducted for 20 marks(Module 1) & reduced to 10 marks	10
	CIE2	Conducted for 20 marks(Module 2) & reduced to 10 marks	10
	CIE3	Conducted for 20 marks(Module 3) & reduced to 10 marks	10
Activity Details	Activity 1		10
	Activity 2		10
Total Marks			**50**

Self-Learning (14 Hours)

- Read one recent IEEE/ACM research paper on Social Network Analysis and present its methodology, findings, and future scope through a seminar or presentation.
- Analyze a social media dataset (Twitter/X, Facebook, LinkedIn, Reddit, etc.) and identify key network metrics.

Activity Based Learning (28 Hours)

• Study real-world social networks (Facebook, LinkedIn, Twitter/X, citation networks, collaboration networks) and prepare a case study report on network properties and applications.	
• Learn and demonstrate one open-source SNA tool (Gephi, NetworkX, Cytoscape, or igraph) by analyzing a sample dataset and preparing a short report.	

Evaluation of Learning Process (6 Hours)

Type of Evaluation	Hours
CIE(1, 2 and 3)	3
Semester End Exam	3
Total	6

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	-	-	-	-	-	-	-	-	-	-	2	-
CO2	-	2	-	-	-	-	-	-	-	-	-	2	-
CO3	-	-	2	-	3	-	-	-	-	-	-	2	-
CO4	-	-	-	-	2	-	-	3	3	-	-	2	2

Course Title	ROBOTIC PROCESS AUTOMATION		
Course Code	24CS665	(L-T-P) C	(3-0-0) 3
Exam Hrs.	3	Hours/Week	3
CIE	50 Marks	Total Hours	42L+ 14SL+28ABL+6EV = 90
SEE	50 Marks		

Course Objective: To equip students with the knowledge and practical skills to design, develop, debug, and deploy Robotic Process Automation (RPA) solutions using UiPath for automating business processes efficiently.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply structural robot configurations using UiPath programming techniques and analyze diverse data extraction strategies.	1	
2.	Analyse advanced control flow mechanisms and manipulate structured or unstructured data types	2	
3.	Develop cross-platform automation sequences by integrating UiPath workflows with major third-party enterprise ecosystems	3	
4.	Collaborate in teams to develop and present projects focusing on debugging automated robotic workflows, evaluate runtime faults through structured logging and exception-handling frameworks	5,8,9,11	

Course Contents:

MODULE – 1 **11 Hrs**

What is Robotic Process Automation? What is Robotic Process Automation? Scope and techniques of automation Robotic process automation, About UiPath, The future of automation. Record and Play: Record and Play, UiPath stack, Downloading and installing UiPath Studio, Learning UiPath Studio**.**

MODULE – 2 **11 Hrs**

Sequence, Flowchart, and Control Flow: Sequence, Flowchart, and Control Flow, Sequencing the workflow, Activities, Control flow, various types of loops, and decision making, Step-by-step example using Sequence and Flowchart, Step-by-step example, using Sequence and Control flow.

Data Manipulation: Data Manipulation, Variables and scope, Collections, Arguments – Purpose and use, Data table usage with examples, Clipboard management, File operation with step-by-step example.

MODULE – 3 **10 Hrs**

Taking Control of the Controls: Taking Control of the Controls, Finding and attaching windows, Finding the control, Techniques for waiting for a control, Act on controls – mouse and keyboard activities, Working with UiExplorer, Handling events, Revisit recorder, Screen Scraping,

Tame that Application with Plugins and Extensions: Tame that Application with Plugins and Extensions, Terminal plugin, SAP automation, Java plugin.

MODULE – 4 **10 Hrs**

Handling User Events and Assistant Bots: Handling User Events and Assistant Bots, What are assistant bots? Monitoring system event triggers, Monitoring image and element triggers, Launching an assistant bot on a keyboard event. **Exception Handling, Debugging, and Logging:** Exception Handling, Debugging, and Logging, Exception handling **Managing and Maintaining the Code:** Managing and Maintaining the Code, Project organization

Pre-requisite:

Text Books

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Learning Robotic Process Automation: Create Software robots and automate business processes with the leading RPA tool – Ui Path	AlokMani Tripathi,	-	Packtpub	2018

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Learning Service Now	Tim Woodruff	-	Packtpub	2017

EBOOKS/MOOC:

https://miet.ac.in/assets/files/UiPATH_RPA_Training_Manual.pdf

Online Courses and Video Lectures:

https://www.uipath.com/rpa/academy

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Class Room Teaching & Learning	3	14	42
2.	Integrated Lab Component	-	14	
3.	Student Study Hours – Self Learning	1	14	14
4.	Activity Based Learning	-	-	28
5.	Evaluation of Learning Process	-	-	06
Total Learning Hours / Semester				**90**

Proposed Assessment Plan (for 50 marks of CIE):

Tool		Remarks	Marks
CIE	CIE1	Conducted for 20 marks(Module 1) & reduced to 10 marks	10
	CIE2	Conducted for 20 marks(Module 2) & reduced to 10 marks	10
	CIE3	Conducted for 20 marks(Module 3) & reduced to 10 marks	10
Activity Details	Activity 1	Execution and documentation of programs listed in self study and ABL	20
Total Marks			**50**

Self-Learning

Develop automation in UiPath StudioX to demonstrate the following activities: Write Line: Message Box, Input Dialog. Modify Text., Text to Left/Right and Delay

Develop automation in UiPath StudioX to demonstrate the following activities: if, Switch., Repeat Number Of Times. , Skip Current, Exit Loop

Develop UI automation in UiPath StudioX to demonstrate the following activities: Use Application/Browser, Go To URL, Navigate Browser, Highlight and Take Screenshot.

Develop UI automation in UiPath StudioX to demonstrate the following activities: Check App State, Click, Type Into, Select Item, Check/Uncheck, Get Text, Get Attribute, Extract Table Data and Hover.

Develop UI automation in UiPath StudioX to demonstrate the following activities: Get Active Window, Maximize Window, Minimize Window, Hide Window, Restore Window and Move Window.

Develop Word automation in UiPath StudioX to demonstrate the following activities: Use Word File.., Save Document As, Read Text, Replace Text in Document, Append Text, Replace Picture, Add Picture, Save Document as PDF.

Activity Based Learning

1. Installation of UiPath StudioX (https://docs.uipath.com/studio/standalone/2022.10/userguide/install-studio) and project to demonstrate the concepts learnt

Evaluation of Learning Process (6 Hours)

Type of Evaluation	Hours
Test (1, 2 and 3)	3
Semester End Exam	3
Total	6

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	2	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	2	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	3	-	-	3	3	-	3	-	-

Course Title	INTRODUCTION TO CLOUD COMPUTING		
Course Code	24OECS61	(L-T-P) C	(3-0-0)3
Exam	3	Hours/Week	3
SEE	50 Marks	Total Hours	42L + 48ABL=90
SEE	50 Marks		

Course Objective: To expose students to frontier areas of cloud computing service models and applications.

Course Outcomes (COs):

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Analyze the evolution of cloud computing and evaluate the challenges in delivering cloud-based IT services.	1, 2	-
2.	Explore the key technical, organizational, architectural and virtualization techniques applied to different types of cloud environment with energy efficiency.	1,7	-
3.	Ascertain different cloud platforms, Cloud Computing services, challenges of cloud computing and tools used in real life scenarios.	1,2,5	-
4.	Explore the security and privacy issues that arise from cloud computing architectures intended for delivering Cloud based IT services.	6,8	-

Course Contents:

MODULE – 1	11 Hrs.
Introduction: Cloud computing at a glance, historical developments, building cloud computing environments, computing platforms and technologies. Principles of parallel and Distributed computing: Eras of computing, parallel vs. Distributed computing, elements of parallel computing, elements of distributed computing, technologies for distributed computing.	
MODULE – 2	**10 Hrs.**
Virtualization: Introduction, characteristics of virtualized environments, Taxonomy of virtualization techniques, virtualization and cloud computing, pros and cons of virtualization technology. Cloud Computing architecture: Introduction, Cloud reference model, types of clouds, economics of the cloud, open challenges.	
MODULE – 3	**10 Hrs.**
Cloud platforms in industry: Amazon Web Services, Google App Engine, Microsoft Azure. Advanced topics in cloud computing: Energy efficiency in clouds, Market based management of clouds, Federated clouds/Inter clouds, Third party cloud services.	
MODULE – 4	**11 Hrs.**
Infrastructure security, IAM: Infrastructure security: network level, host level, application level, Identity and Access management: trust boundaries and IAM, why IAM? IAM challenges, IAM definitions, IAM architecture and practices, getting ready for cloud, IAM standards and protocols for cloudservices, IAM practices in the cloud, cloud authorization management. Security management in the cloud: security management standards, security management in the cloud, availability management, Saas, Paas. Iaas availability management, access control, security vulnerability, patch and configuration management. Privacy: What is privacy? What is data life cycle? What are the key privacy concerns in cloud? who is responsible for protecting privacy?	

Pre-requisite (If any)

Text Books

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Mastering Cloud Computing	Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi		McGraw Hill publication	
2.	Cloud security and privacy an enterprise perspective on risks and compliances	Tin Mather, Subra Kumarswamy, Shahed Latif			2013

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Cloud Computing: Theory and Practice	Dan C Marinescue	1st	MK publishers	
2.	Cloud Computing- A practical approach	Anthony T. Velte, Toby J. Velte, Robert Elsenpeter.		McGraw Hill publication	

EBOOKS/MOOC:

1. https://www.coursera.org/learn/cloud-computing

Online Courses and Video Lectures:

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Class Room Teaching & Learning	3	14	42
2.	Integrated Lab Component	-	-	-
3.	Student Study Hours – Self Learning	-	-	-
4.	Activity Based Learning (ABL1 & ABL2)	-	-	28
5.	Evaluation of Learning Process	-	-	20
			Total Learning Hours / Semester	**90**

Proposed Assessment Plan (for 50 marks of CIE):

Tool		Remarks	Marks
CIE	CIE1	Conducted for 20 marks and reduced to 10 marks	10
	CIE2	Conducted for 20 marks and reduced to 10 marks	10
	CIE3	Conducted for 20 marks and reduced to 10 marks	10
Activity Details	Activity 1	Group Activity will be conducted using various cloud platforms	20
	Activity 2		
		Total Marks	**50**

Self-Learning

Activity Based Learning

Demonstrate working of different Cloud platforms.

Evaluation of Learning Process

Demonstration, Presentation and individual Report

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	2	-	-	-	-	-	-
CO3	3	2	-	-	2	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	2	-	2	-	-	-	-	-

Course Title	INTRODUCTION TO JAVA PROGRAMMING		
Course Code	24OECS62	(L-T-P) C	(3-0-0) 3
Exam Hrs.	3	Hours/Week	3
CIE	50 Marks	Total Hours	42L+ 14SL+28ABL+6EV = 90
SEE	50 Marks		

Course Objective: Develop java application programs using object-oriented concepts.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply object-oriented programming principles to solve computational problems using Java.	1	
2.	Analyze the given java program to make suitable changes and write the output	2	
3.	Design error-tolerant and component-based Java applications using interfaces, packages, and exception handling mechanisms	3	
4.	Conduct practical experiments for demonstrating object oriented concepts through java	5,8,9,11	

Course Contents:

MODULE – 1 — **11 Hrs**

Object Oriented Concepts and Java: Concepts of Object-Oriented programming language: Object, Class, Message passing, inheritance, encapsulation, and polymorphism Difference between OOP and other conventional programming – advantages and disadvantages of OOP.

Java Programming Fundamentals: The Byte Code, The Java Buzzwords, A first Simple program, The Java Keywords, Identifiers in Java.

Data Types and Operators: Java's Primitive Types, The Scope and Lifetime of Variables, Operators: Arithmetic, Bitwise, Relational, Boolean Logical, Assignment Operators, the '?' Operator, Type conversion and Casting, Arrays, Strings

MODULE – 2 — **11 Hrs**

Program Control Statements: Input characters from the Keyboard, if statement, Nested ifs, if-else-if Ladder, Switch Statement, Nested switch statements, for Loop, While Loop, do-while Loop, Use of break and continue.

Introducing Classes, Objects and Methods: Class Fundamentals, Declaring Objects, Object Reference Variables, Methods, Constructors, the "This" keyword, Garbage collection, Overloading Methods and constructors, Argument Passing, Returning Objects, Access Control, Understanding Static, Nested and Inner Classes.

MODULE – 3 — **10 Hrs**

Inheritance: Inheritance Basics, Member Access and Inheritance, Constructors and inheritance, Using super to C all Superclass constructors, Using super to Access Superclass Members, Creating a Multilevel Hierarchy, When are Constructors Executed, Superclass References and Subclass Objects, Method Overriding, Overridden Methods support polymorphism, Why overridden Methods, Using Abstract Classes, Using final.

MODULE – 4 — **10 Hrs**

Interfaces: Interface Fundamentals, Creating an Interface, Implementing an Interface, Implementing Multiple Interfaces, Packages: Package Fundamentals, Packages and Member Access, Importing Packages.

Exception Handling: Exception-Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and Catch, Multiple catch Clauses, throw, finally.

Pre-requisite: Knowledge of basic C/Python programming language

Text Books

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Java –The complete Reference	Herbert Schildt	8	Tata Mcgraw Hill	2017

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Java Programming	Hari Mohan Pandey	-	Pearson Education	2012
2.	Programming with Java – A Primer	E. Balagurusamy	8	McGraw Hill	2023

EBOOKS/MOOC:

1. http://www.nptelvideos.com/java/java_video_lectures_tutorials.php
2. https://www.youtube.com/watch?v=0KL_zftem4g

Online Courses and Video Lectures:

1. http://nptel.ac.in/courses/106106147/
2. https://www.coursera.org/specializations/object-oriented-programming

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Class Room Teaching & Learning	3	14	42
2.	Integrated Lab Component	-	14	
3.	Student Study Hours – Self Learning	1	14	14
4.	Activity Based Learning	-	-	28
5.	Evaluation of Learning Process	-	-	06
Total Learning Hours / Semester				**90**

Proposed Assessment Plan (for 50 marks of CIE):

Tool		Remarks	Marks
CIE	CIE1	Conducted for 20 marks(Module 1) & reduced to 10 marks	10
	CIE2	Conducted for 20 marks(Module 2) & reduced to 10 marks	10
	CIE3	Conducted for 20 marks(Module 3) & reduced to 10 marks	10
Activity Details	Activity 1	Execution and documentation of programs listed in self study and ABL	20
		Total Marks	**50**

Self-Learning

Write java programs
a. To print Fibonacci series without using recursion and using recursion.
b. To check prime numbers.
c. To sort an array element using bubble sort algorithm

Create a class called account with the data members (accNum: integer, name: string, phoneNum:integer, balAmt:float) and following methods:
a. getInput() to get input from the user.
b. deposit() method which takes the amount to be deposited in to his/her account and do the calculation.
c. withdraw() method which gets the amount to be withdrawn from hi/her account.
d. Print the appropriate results

Write a Java program to create a class called Shape with a method called getArea(). Create a subclass called Rectangle that overrides the getArea() method to calculate the area of a rectangle

Write a Java program to create an abstract class BankAccount with abstract methods deposit () and withdraw (). Create subclasses: SavingsAccount and CurrentAccount that extend the BankAccount class and implement the respective methods to handle deposits and withdrawals for each account type

Write a Java program that reads a list of integers from the user and throws an exception if any numbers are duplicates.

Activity Based Learning ()

Develop a java application for the given real world problems using OOP concepts.

Evaluation of Learning Process (6 Hours)

Type of Evaluation	Hours
Test (1, 2 and 3)	3
Semester End Exam	3
Total	6

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	2	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	2	-	-	-	-	-	-	-	-	-	-

CO4	-	-	-	-	3	-	-	3	3	-	3	-	-

Course Title	WEB TECHNOLOGY		
Course Code	24OECS63	(L-T-P) C	(3-0-0)3
Exam	3	Hours/Week	3
SEE	50 Marks	Total Hours	42L + 28ABL+14SL+6EV=90

Course Objective: Create web pages with client-side and server-side scripting.

Course Outcomes (COs): Upon completion of the course, students shall be able to

#	Course Outcomes	Mapping to POs	Mapping to PSOs
5.	Apply the knowledge of HTML/XHTML and CSS in designing webpage.	1	-
6.	Analyze and develop dynamic web applications using JavaScript, XML, PHP, and MySQL	2,5	-
7.	Develop client and server side script to design webpage.	3,5	-
8.	Create database-driven web applications by integrating PHP and MySQL through effective teamwork for real-world problem-solving	3,5,6,8,9	-

Course Contents:

MODULE – 1	10 Hrs

Fundamentals of Web, XHTML: Internet, WWW, Web Browsers, and Web Servers; URLs; MIME; HTTP; the Web Programmers Toolbox. XHTML: Basic syntax; Standard structure; basic text markup; Images; Hypertext Links; Lists; Tables; Forms; the audio element, the video element, organization elements, time element

MODULE – 2	10 Hrs

CSS: Introduction; Levels of style sheets; Selector forms; Property value forms; Font properties. List properties; Color; Alignment of text; The box model; Background images; Theand tags.

JavaScript: Overview of JavaScript; Syntactic characteristics; Primitives, operations, and expressions; Screen output and keyboard input; Control statements; Arrays; Functions; Pattern matching using regular expressions.

MODULE – 3	11Hrs

JavaScript and HTML Documents: The JavaScript execution environment; Element access in JavaScript; Events and event handling; Handling events from the Body elements, Button elements, Text box and Password elements; The navigator object.

Dynamic Documents with JavaScript: Introduction to dynamic documents; Element positioning; Moving elements; Element visibility; Changing colors and fonts; Dynamic content; Stacking elements; Locating the mouse cursor.

MODULE – 4	11 Hrs

PHP: Origins and uses of PHP; Overview of PHP; General syntactic characteristics; Primitives, operations and expressions; Output; Control statements; Arrays; Functions; Pattern matching.

Database Access :Form handling; Database Access using PHP and MySQL, Cookies; Session tracking;

Pre-requisite (If any)

Text Books

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Programming the World Wide Web	Robert W. Sebesta	8th Edition,	Pearson Education	2014

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Internet and World Wide Web How to program	Deitel H.M. and Deitel P.J.	4th Edition.	Pearson International	2012
2.	Fundamentals of Web Development	Randy Connolly, Ricardo Hoar	-	Pearson	2015
3.	Internet Technology and Web Design	ISRD Group	-	Tata McGraw Hill	2011

				Publishing Ltd,	

EBOOKS/MOOC:

1. https://www.mooc-list.com/course/programming-and-web-beginners-coursera
2. https://archive.nptel.ac.in/courses/106/105/106105084/
3. https://www.coursera.org/specializations/web-design
4. http://www.w3c.org

Online Courses and Video Lectures:

1. https://www.mooc-list.com/course/programming-and-web-beginners-coursera
2. https://archive.nptel.ac.in/courses/106/105/106105084/
3. https://www.coursera.org/specializations/web-design
4. http://www.w3c.org

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
6.	Class Room Teaching & Learning	3	14	42
7.	Student Study Hours – Self Learning	1	14	14
8.	Activity Based Learning (ABL1 & ABL2)	-	-	28
9.	Evaluation of Learning Process			06
			Total Learning Hours / Semester	**90**

Proposed Assessment Plan (for 50 marks of CIE):

Tool		Remarks	Marks
CIE	CIE1	Conduction for 20 marks & reduced to 10 marks	10
	CIE2	Conduction for 20 marks & reduced to 10 marks	10
	CIE3	Conduction for 20 marks & reduced to 10 marks	10
Activity Details	Activity	Group based activity to create web application.	20
		Total Marks	**90**

Self-Learning(14 hours)

- Personal Portfolio Website
- Online Quiz Application
- To-Do List using JavaScript
- Student Registration Portal
- Weather Information Website using REST API

Activity Based Learning (28 hours)

- Develop a Personal Portfolio Website using HTML5, CSS3, and responsive design techniques.
- Design and Validate an Online Registration Form with HTML forms, CSS styling, and JavaScript validation.
- Build a Simple E-Commerce Website Prototype with product pages, shopping cart interface, and responsive navigation.

Evaluation of Learning Process

Type of Evaluation	Hours
CIE (1, 2 and 3)	3
Activity	
Semester End Exam	3
Total	06

Course Articulation matrix													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	2	-	-	3	-	-	-	-	-	-	-	-
CO3	-	-	2	-	3	-	-	-	-	-	-	-	-
CO4	-	-	2	-	3	2	-	2	2	-	-	-	-

Course Title	APPLICATION DEVELOPMENT LABORATORY		
Course Code	24CS607A	(L-T-P) C	(0-0-2) 1
Exam Hrs.	3	Hours/Week	2
CIE	50 Marks	Total Hours	28P+2EV = 30
SEE	50 Marks		

Course Objective: Design and develop apps for android devices.

Course Outcomes (COs): Upon completion of the course, students shall be able to

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Develop simple applications, using built-in widgets and components of android studio.	3, 5, 11	1, 2
2.	Document and present the apps designed.	8, 9, 11	1

Course Contents:

1. Develop an android application which accepts the SGPA of all the six semesters and displays your CGPA.
2. Develop an android application to login into a system which is redirected to the Home screen.
The login should be successful on email: admin@example.com password: rtWi2p_10 If the email/password is invalid display a Toast with an error message
3. Assume you are accepting employee details: Name, Designation, Salary, Phone number. Develop app that displays an alert message if phone number entered is more than 10 digits.
4. Design an app that displays the names of all planets in our universe. Clicking on "Solar System" in first activity should display all the planet's names in second activity and it should return the total number of planets to first activity.
5. Develop a QUIZ app that displays a question with four answers as options. Clicking an option should display whether the selected option is right or wrong.
6. Assume you need to accept order online for fast food items. Design an app such that it accepts the order for multiple items and displays the total amount to be paid on placing the order.
7. Design an app to display menu options on clicking a button "FILE". The menu options are: New, Open, Save, Save as, And Print. Clicking on any option should display the relevant information.
8. Design an app to accept your name, roll number and branch programmatically.
9. Develop an android application to list all the engineering branches of MCE and displays a brief information of any department which the user clicks on in a separate page.
10. Consider a scenario where you need to send an email to multiple users. Design an app to implement the same.
11. Develop an android application to display a gallery view (Grid View) of at least 10 images.
12. Develop an android application to render the text data into Text View from the remote server. Show progress bar when the data is loading or Toast message if data fails to load.

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Class Room Teaching & Learning	2	14	28
2.	Evaluation of Learning Process			2
			Total Learning Hours / Semester	**30**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks		Marks
CIE	CIE1	Lab CIE	20
	CIE2	Report	10
Activity Details	Activity	Design an app for a given scenario	20
		Total Marks	**50**

Evaluation of Learning Process

Conducting Lab CIE for the listed program

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	3	-	3	-	-	-	-	-	3	2	2
CO2	-	-	-	-	-	-	-	3	3	-	3	2	-

Course Title	GENERATIVE AI TOOLS		
Course Code	24CS607B	(L-T-P) C	(0-0-2) 1
Exam Hrs.	3	Hours/Week	2
CIE	50 Marks	Total Hours	28P+2EV = 30
SEE	50 Marks		

Course Objective: To gain knowledge of Generative AI Tools

Course Outcomes (COs): Upon completion of the course, students shall be able to

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply the Generative AI tools to ease everyday tasks	1, 5	
2.	work effectively in collaborative teams, utilizing modern engineering tools, and delivering inclusive technical presentations	8, 9,10,11	

Course Contents:

1. Write precise prompts to extract key statistical summaries, identify anomalous data points, and generate a clean Pandas data frame script to visualize the underlying distributions
2. Generate a multi-card presentation layout using Gamma AI to present a comprehensive, structured overview of a cloud computing seminar topic.
3. Create a sequence diagram using Mermaid.js that maps the end-to-end communication flow of a distributed Microservices-based Order Processing System.
4. Upload a raw dataset in CSV format to Julius AI to perform automated data cleaning, execute an exploratory statistical analysis, and generate corresponding visualization charts using plain English prompts.
5. Use Perplexity AI to conduct an in-depth, real-time technical exploration of a newly released machine learning library, extracting its installation protocols, core API methods, and verifiable source citations.
6. Conduct a target literature review using Consensus AI to analyze the application of Convolutional Neural Networks (CNNs) in plant disease detection.
7. Formulate a structured text prompt for v0 by Vercel to generate a responsive, dark-themed Student Hackathon Dashboard.
8. Use Lovable AI to build and deploy a full-stack CRUD application by connecting a custom frontend dashboard to a live Supa base database backend using natural language prompts.
9. Upload a set of technical documents to Notebook LM to generate a summarized project overview and an interactive study guide.
10. Use Notebook LM to convert a set of lecture notes and textbook chapters into an automated audio briefing and an interactive revision quiz

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
3.	Class Room Teaching & Learning	2	14	28
4.	Evaluation of Learning Process			2
			Total Learning Hours / Semester	**30**

Proposed Assessment Plan (for 50 marks of CIE):

Tool		Remarks	Marks
CIE	CIE1	Lab CIE	20
	CIE2	Report	10
Activity Details	Activity	Design an solution for real world problem	20
		Total Marks	**50**

Evaluation of Learning Process

Conducting Lab CIE for the listed program

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	-	-	-	3	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	2	3	3	2	-	-

Course Title	AUTOMATED SOFTWARE TESTING		
Course Code	24CS607C	(L-T-P) C	(0-0-2) 1
Exam Hrs.	3	Hours/Week	2
CIE	50 Marks	Total Hours	28P+2EV = 30
SEE	50 Marks		

Course Objective: To design and execute automated tests using Selenium for effective web application testing.

Course Outcomes (COs): Upon completion of the course, students shall be able to

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply automated testing tools to validate software functionality in real-world scenarios.	1, 2	2
2.	Design and execute automated test cases for web applications and APIs using appropriate testing techniques.	3, 5	2
3.	Implement data-driven, cross-browser, and functional testing strategies to ensure software quality and reliability	9, 10, 11	1, 2

Course Contents:

1. A college portal allows students to log in using a username and password.
Task - Automate the login page, Verify successful login with valid credentials, Verify error messages for invalid credentials.
Tool - Selenium WebDriver
Expected Outcome - Automated validation of login functionality.
2. Students register for courses through an online portal.
Task - Automate course registration, Validate mandatory fields, Verify successful registration message.
Tool - Selenium WebDriver + TestNG
Expected Outcome - Automated testing of registration workflow.
3. Customers search for products in an online shopping application.
Task - Search for products using keywords, Verify search results, Validate no-result scenarios.
Tool - Selenium WebDriver
Expected Outcome - Automated search functionality testing.
4. A customer adds products to a shopping cart.
Task - Add multiple products, Verify cart count and total amount, Remove a product and verify updates.
Tool - Selenium WebDriver
Expected Outcome - Validation of shopping cart operations.
5. Employees apply for leave through a web portal.
Task - Automate leave application submission, Validate date fields, Verify leave request confirmation.
Tool - Selenium + JUnit
Expected Outcome - Automated testing of leave request workflow.
6. A banking application supports multiple users.
Task - Read usernames and passwords from Excel, Execute login tests for multiple datasets, Generate pass/fail results.
Tool - Selenium + Apache POI
Expected Outcome - Implementation of data-driven testing.
7. A customer transfers funds between accounts.
Task - Automate fund transfer, Verify account balance updates, Validate transaction success message.
Tool - Selenium + TestNG
Expected Outcome - Automated business transaction testing.
8. A Student Management System exposes REST APIs.
Task - Test GET API for retrieving student records, Test POST API for adding a new student, Validate response status and JSON data.
Tool - Postman / REST Assured
Expected Outcome - Automated API testing.
9. A university portal should function correctly across browsers.
Task - Execute the same test cases on Chrome, Firefox, and Edge, Compare execution results.
Tool - Selenium WebDriver

Expected Outcome - Validation of browser compatibility.
10. A software company wants automated tests to run whenever code changes are pushed to the repository.
Task - Configure Jenkins/GitHub Actions, Execute automated test suites, Generate execution reports.
Tool - Jenkins + Selenium + TestNG
Expected Outcome - Integration of automated testing into a CI/CD pipeline.

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Class Room Teaching & Learning	2	14	28
2.	Evaluation of Learning Process	-	-	2
			Total Learning Hours / Semester	**30**

Proposed Assessment Plan (for 50 marks of CIE):

Tool		Remarks	Marks
CIE	**CIE1**	Lab CIE	20
	CIE2	Report	10
Activity Details	**Activity**	Design an solution for real world problem	20
		Total Marks	**50**

Evaluation of Learning Process

Conducting Lab CIE for the listed program

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	-	2
CO2	-	-	3	-	3	-	-	-	-	-	-	-	2
CO3	-	-	-	-	-	-	-	-	2	2	2	2	2

Course Title	DEVOPS		
Course Code	24CS607D	(L-T-P) C	(0-0-2) 1
Exam Hrs.	3	Hours/Week	2
CIE	50 Marks	Total Hours	28P+2EV = 30
SEE	50 Marks		

Course Objective: To introduce the fundamental concepts, practices, and cultural philosophy of DevOps, emphasizing collaboration between development and operations teams.

Course outcomes (Course Skill Set): Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply build tool to manage Java applications using Maven and Gradle.	1	1
2.	Analyze Maven and Gradle build tools and their significance in modern software development for project build automation.	2,5	1

Course Contents:

1.	**Demonstration:** • **Introduction to Maven and Gradle:** Overview of Build Automation Tools, Key Differences Between Maven and Gradle, Installation and Setup. • **Working with Maven:** Creating a Maven Project, Understanding the POM File, Dependency Management and Plugins. **Working with Gradle:** Setting Up a Gradle Project, Understanding Build Scripts (Groovy and Kotlin DSL), Dependency Management and Task Automation
	Practical Exercise: Build and Run a Java Application with Maven, Migrate the Same Application to Gradle
2.	**Demonstration:** • **Introduction to Jenkins:** Practical Exercise and Wrap-Up: Build and Deploy a Complete DevOps Pipeline, Discussion on Best Practices and Q&A • **Continuous Integration with Jenkins:** Setting Up a CI Pipeline, Integrating Jenkins with Maven/Gradle, Running Automated Builds and Tests **Configuration Management with Ansible:** Basics of Ansible: Inventory, Playbooks, and Modules, Automating Server Configurations with Playbooks, Hands-On: Writing and Running a Basic Playbook
	Practical Exercise: Set Up a Jenkins CI Pipeline for a Maven Project, Use Ansible to Deploy Artifacts Generated by Jenkins
3.	**Demonstration:** • **Introduction to Azure DevOps:** Overview of Azure DevOps Services, Setting Up an Azure DevOps Account and Project • **Creating Build Pipelines:** Building a Maven/Gradle Project with Azure Pipelines, Integrating Code Repositories (e.g., GitHub, Azure Repos), Running Unit Tests and Generating Reports **Creating Release Pipelines:** Deploying Applications to Azure App Services, Managing Secrets and Configuration with Azure Key Vault, Hands-On: Continuous Deployment with Azure Pipelines
	Practical Exercise and Wrap-Up: Build and Deploy a Complete DevOps Pipeline, Discussion on Best Practices and Q&A

Course outcomes (Course Skill Set):

At the end of the course the student will be able to:

- Demonstrate different actions performed through Version control tools like Git.
- Perform Continuous Integration and Continuous Testing and Continuous Deployment using Jenkins by building and automating test cases using Maven & Gradle.
- Experiment with configuration management using Ansible.
- Demonstrate Cloud-based DevOps tools using Azure DevOps.

Pre-requisite (If any)

Textbooks

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	DevOps for Beginners	Jospeh Joyner	-	Tech Tron	2015

EBOOKS/MOOC:

NPTEL – *"Cloud Computing and DevOps"*

Online Resources and Video Lectures:

Suggested Learning Resources:

- https://www.geeksforgeeks.org/devops-tutorial/
- https://www.javatpoint.com/devops
- https://www.youtube.com/watch?v=2N-59wUIPVI
- https://www.youtube.com/watch?v=87ZqwoFeO88

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks		Marks
CIE	**CIE1**	Conduction of CIE	30
Activity Details	**Activity 1**	Project Based Learning	20
		Total Marks	**50**

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Classroom Teaching & Learning	2	14	28
2.	Integrated Lab Component	-	-	-
3.	Student Study Hours – Self Learning	-	-	-
4.	Activity Based Learning (ABL1 & ABL2)	-	-	-
5.	Evaluation of Learning Process	-	-	2
	Total Learning Hours / Semester			**30**

Evaluation of Learning Process

Type of Evaluation	Hours
Test (1, 2 and 3)	**2**
Semester End Exam	**3**
Total	**5**

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	3	-
CO2	-	3	-	-	3	-	-	-	-	-	-	3	-